WEAM008101

Operation & Maintenance Manual

PC88MR-6

HYDRAULIC EXCAVATOR

SERIAL NUMBER

PC88MR-6 F00003 and up

WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine.
This manual should be kept inside the cab for reference and periodically reviewed by all personnel who will come into contact with the machine.

KOMATSU

Utility

1.1 FOREWORD

- This manual has been compiled by Komatsu Utility S.p.A. in order to supply customers with all the necessary information on the machine and on safety regulations, as well as the use and maintenance instructions that enable the operator to exploit the capacity of the machine with optimal results and to keep the machine efficient over time.
- The operation manual, together with the spare parts catalogue, is an integral part of the machine and must accompany it, even when it is resold, until its final disposal.
- The manual must be handled with the greatest care and always kept on board the machine, so that it can be consulted at any moment; it must be placed in the pocket behind the seat, where the registration documents and the logbook are usually kept.
- This manual must be given to the staff who have to use the machine and carry out the routine maintenance operations; they must read the contents carefully more than once, in such a way as to clearly understand what are the correct operating conditions and the dangerous conditions that must be avoided.
  In case of loss or damage, request a new copy to Komatsu or your Komatsu Dealer.
- The illustrations contained in this manual may represent machine configurations available on request.
  Komatsu machines are constantly improved in order to increase their efficiency and reliability; this manual sums up all the information regarding the most recent technology applied at the moment in which the machine is launched.
  For any further and/or updated information, contact your Komatsu Dealer.
- Punctual periodic annotations regarding the maintenance operations that have been carried out are important, since they provide a clear report on the situation and say exactly what has been done and what has to be done after the next maintenance interval. Therefore, it is advisable to consult both the hour meter and the maintenance plan frequently.
- Over the years Komatsu Dealers have gathered considerable experience in customer service.
  If more information is needed, do not hesitate to contact your Komatsu Dealer: he always knows how to get the best performance from the machine, he can recommend the equipment that is most suitable for specific needs and can provide the technical assistance necessary for any change that may be required to conform the machine to the safety standards and traffic rules.
  Furthermore, Komatsu Dealers also offer assistance for the supply of Komatsu genuine spare parts, which guarantee safety and interchangeability.
- The table included in this manual must be filled in with the machine data, which are also the data that must be communicated to the Dealer when requiring assistance and ordering spare parts.

⚠ CAUTION

- **The incorrect use of the machine and inappropriate maintenance operations may cause serious injury and even death.**
- **Operators and maintenance personnel must carefully read this manual before using the machine or performing maintenance operations.**
- **Any serious accident that may occur during the use of the machine or during maintenance operations is due to failure to comply with the instructions given herein.**
- **The application of the procedures and precautions described in this manual will ensure safety only provided that the machine is used correctly.**
  If the machine is used for any purpose or in any way other than those described herein, the operator shall be responsible for his own safety and for the safety of any other person involved.

1.2 INFORMATION ON SAFETY

Many accidents are caused by insufficient knowledge of and failure to comply with the safety regulations prescribed for the maintenance operations that must be performed on the machine.
In order to avoid accidents, before starting work and before carrying out any maintenance operation, carefully read and be sure to understand all the information and warnings contained in this manual and given on the plates applied onto the machine. To enable the operator to use this machine safely, safety precautions are explained in this manual and labels and warning plates are affixed to the machine to highlight situations involving potential hazards and suggest how to avoid them.

Terminology used in the signs

The following words are used in the signs to inform the user that there is a potential hazard that may lead to personal injury or damage to property.
In this manual, on the labels and on the plates, the following words are used to express the potential level of the hazard.

⚠ DANGER

- **Indicates a situation of imminent danger that, if not avoided, may cause serious injury and even death. The use of this term must be limited to situations of extreme danger.**

⚠ WARNING

- **Indicates a situation of potential danger that, if not avoided, may cause serious injury and even death.**

⚠ CAUTION

- **Indicates a situation of potential danger that, if not avoided, may cause moderate injury. This term can also be used as a warning against dangerous interventions.**

Other terms used in the signs

In addition to those indicated above, the following warning terms are used to recommend the precautions to be taken to protect the machine or to supply useful information.

IMPORTANT

- **This term is used to indicate precautions that must be taken in order to avoid actions that may shorten the life of the machine.**

NOTE

- This word is used to indicate a useful piece of information.

Komatsu cannot reasonably predict every circumstance that might involve a potential hazard during the operation or maintenance of the machine; for this reason, the safety warnings included in this manual and applied onto the machine may not include all possible safety precautions.
If all the instructions given in relation to this machine are kept to, the operators and anyone in the vicinity can work in total safety, and do not run the risk of damaging the machine. In case of doubt regarding the safety measures necessary for some procedures, contact Komatsu or your local Komatsu Dealer.

⚠ DANGER

- **Before starting any maintenance operation, position the machine on a firm and level surface, lower the equipment to the ground, engage the safety locks of the equipment and the controls, and stop the engine.**

⚠ DANGER

- **To make the information clearer, some illustrations in this manual represent the machine without safety guards. Do not use the machine without guards and do not start the engine when the hood is open, unless this is expressly prescribed for certain maintenance operations.**

⚠ WARNING

- **It is strictly forbidden to modify the setting of the hydraulic system safety valves; Komatsu cannot be held liable for any damage to persons, property or the machine, if this has been tampered with by modifying the standard settings of the hydraulic system.**

⚠ WARNING

- **Before carrying out any electric welding, disconnect the battery and the alternator. (See "2.4.17 PRECAUTIONS TO BE TAKEN WHEN HANDLING THE BATTERY AND THE ALTERNATOR").**

⚠ WARNING

- **Install only authorized optional equipment (see "6.1.3 CHARACTERISTICS OF THE OPTIONAL EQUIPMENT").**

⚠ DANGER

- **It is absolutely forbidden to operate the machine while standing on the ground.**
  Every single manoeuvre must be carried out by the operator, correctly seated in driving position.

1.3 INTRODUCTION

1.3.1 INTENDED USE OF THE MACHINE

The Komatsu machines described in this manual have been designed and constructed to be used mainly for EXCAVATION and EARTH-MOVING OPERATIONS.

If provided with suitable safety devices, they can be used with authorized optional equipment having the characteristics illustrated in paragraph "6.1 AUTHORIZED OPTIONAL EQUIPMENT".

1.3.2 IMPROPER OR UNAUTHORIZED USES

⚠ CAUTION

- **This paragraph describes some of the improper or unauthorized uses of the machine; since it is impossible to predict all the possible improper uses, if it is necessary to use the machine for particular applications, contact your Komatsu Dealer before carrying out the work.**

IMPORTANT

- **The instructions regarding the authorized optional equipment are given in the relevant operation and maintenance manuals; if the equipment is supplied by Komatsu, these publications are enclosed to this manual.**
- **The instructions regarding the assembly of the authorized equipment, the controls requiring special arrangements on the machine and the hydraulic couplings necessary for the operation of such equipment are grouped in the final section of this manual.**

Komatsu machines are constructed exclusively for the handling, excavation and treatment of inert materials; therefore, the following uses are absolutely forbidden:

- USE OF THE MACHINE BY MINORS OR INEXPERIENCED PERSONS.
- USE OF THE MACHINE FOR LIFTING PERSONS OR OBJECTS.
- TRANSPORT OF CONTAINERS WITH FLAMMABLE OR DANGEROUS FLUIDS.
- USE OF THE BUCKET FOR DRIVING OR EXTRACTING PILES.
- USE OF THE MACHINE FOR TOWING DAMAGED VEHICLES.

1.3.2.1 MAIN CHARACTERISTICS

- Simple and easy operation.
- Hydrostatic transmission obtained through two variable displacement motors that operate epicyclic reduction gears equipped with negative hydraulic brakes.
- Rotation of the turret achieved by means of an axial piston hydraulic motor acting on an epicyclic reduction gear.
- Ball-bearing ring teeth and pinion lubricated in grease bath.
- Main equipment controlled through servo levers ensuring also combined movements that can be modulated proportionally and continually.
- Boom swing and travel controls with servo pedals ensuring movements that can be modulated proportionally and continuously.
- Travel speed increase function controlled with a button.
- Servo controls also for two-piece boom and blade.
- Complete series of instruments visible from the operating position.
- Hand accelerator.
- Easy maintenance with simplified intervals.

1.3.3 RUNNING-IN

Every machine is scrupulously adjusted and tested before delivery.
A new machine, however, must be used carefully for the first 100 hours, in order to ensure proper running-in of the various components.
If the machine is subjected to excessive work load at the beginning of operation, its potential productivity and its functionality will be shortly and untimely reduced.
Every new machine must be used carefully, paying special attention to the following instructions:

- After the start, let the engine idle for 5 minutes, in such a way as to warm it up gradually before actual operation.
- Avoid operating the machine with the limit loads allowed or at high speed.
- Avoid abrupt starts or accelerations, useless sudden decelerations and abrupt reversals.
- After the first 250 hours of use, carry out the following operations, in addition to those to be performed every 250 hours:
  1 - Change the engine oil.
  2 - Change the engine oil filter.
  3 - Change the fuel filter.

SYNTHETIC BIODEGRADABLE OIL TYPE HEES

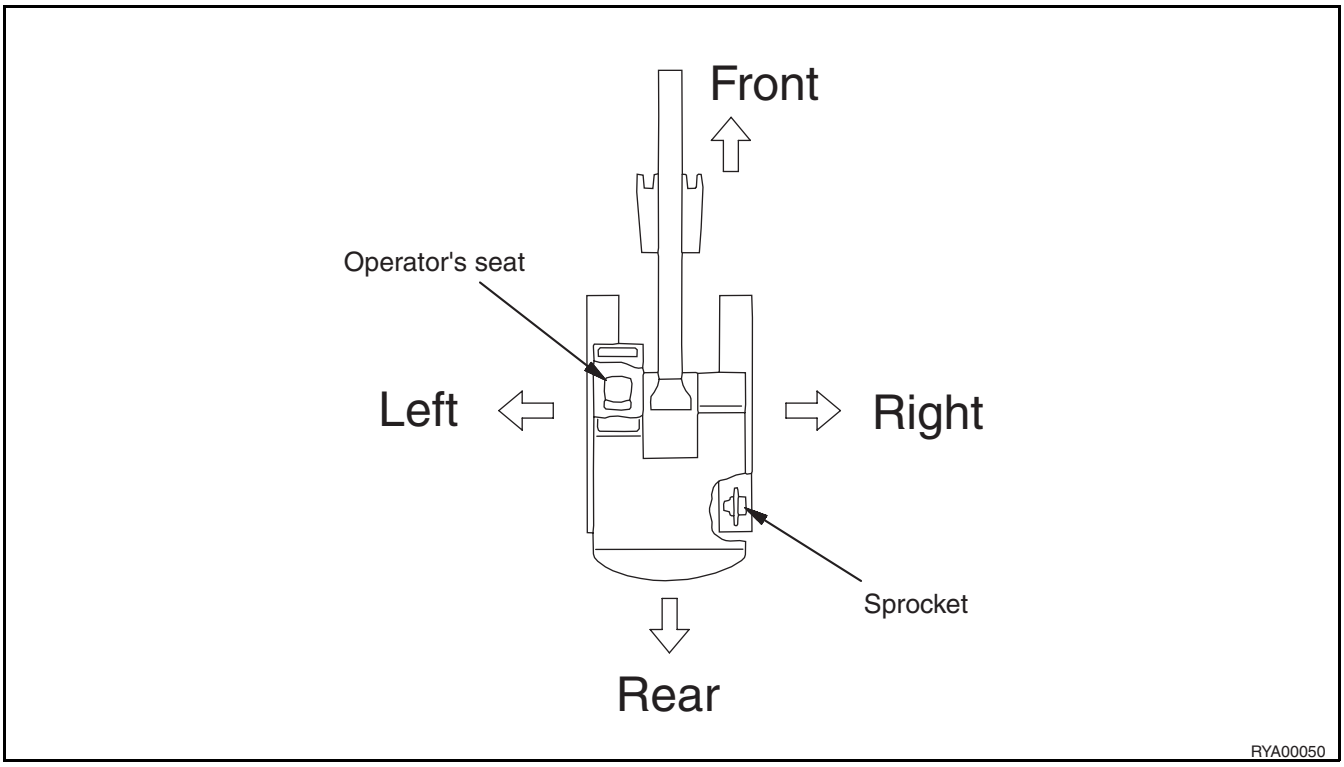
For machines in which synthetic biodegradable oil type HEES is used, perform the following operations in addition to the standard maintenance operations:

- After the first 50 hours of operation, change the hydraulic circuit drain filter.
- After the first 500 hours of operation, change the hydraulic circuit oil.

IMPORTANT

- **When changing the oil filters (cartridges), check their inner part to make sure that there are no deposits. If considerable deposits are observed, find out what may have caused them before starting the machine.**
- **The number of operating hours is indicated by the hour meter.**

1.3.4 POSITIONS AND DIRECTIONS OF THE MACHINE



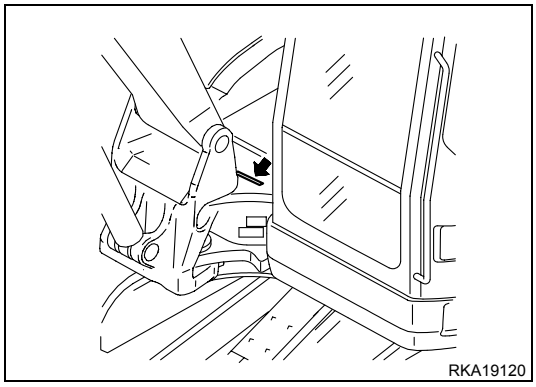
In this manual, the terms front/forward, rear/backward, left, and right refer to the travel direction as seen from the operator seat when it is facing the front and the sprocket is at the rear of the machine.

1.4 PRODUCT IDENTIFICATION

The Komatsu excavator and its main components are identified by serial numbers stamped on the identification plates.
The serial number and the identification numbers of the components are the only numbers that must be communicated to the Dealer when requiring assistance and ordering spare parts.

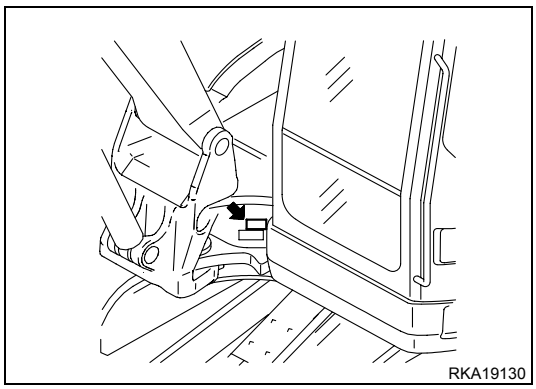
1.4.1 MACHINE SERIAL NUMBER

The machine serial number is stamped on the front upper part of the main frame.


RKA19120

1.4.2 MACHINE IDENTIFICATION PLATE AND PRODUCT IDENTIFICATION NUMBER (PIN)

The Komatsu excavators described in this manual are CE marked, in fact they are in compliance with the EU harmonised standards.
The plate with the CE marking is applied to the front wall of the main frame, on the left side.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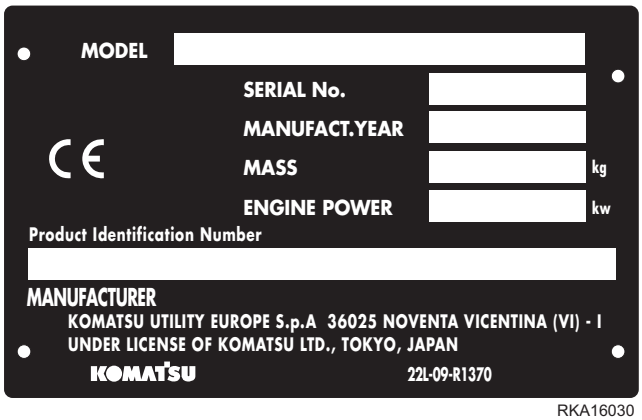

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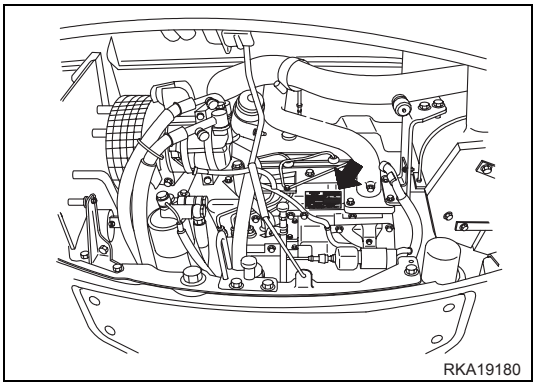
1.4.3 ENGINE SERIAL NUMBER AND EXHAUST GAS EMISSION PLATE

The plate indicating the engine serial number and the exhaust emissions is positioned on the outside of the engine block.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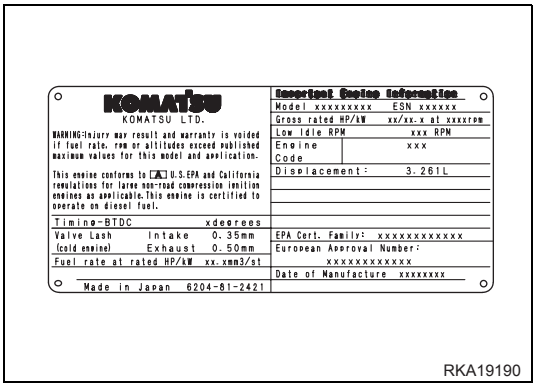
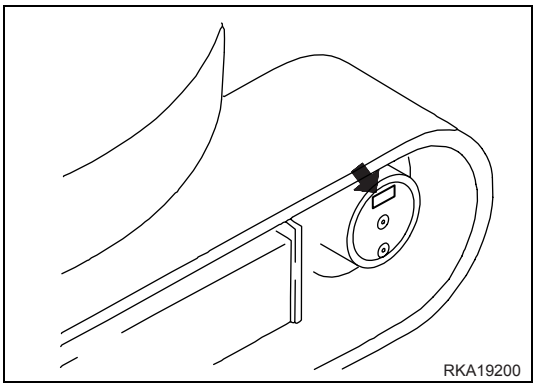

KOMATSU
KOMATSU LTD.
WARNING-Injury may result and warranty is voided if fuel rate, rpm or altitudes exceed published maximum values for this model and application.
This engine conforms to U.S.EPA and California regulations for large non-road compression ignition engines as applicable. This engine is certified to operate on diesel fuel.
Timing-BTDC xdegrees
Valve Lash Intake 0.35mm
(cold engine) Exhaust 0.50mm
Fuel rate at rated HP/kW xx.xmm3/st
Made in Japan 6204-81-2421
Important Engine Information
Model xxxxxxxxx ESN xxxxxx
Gross rated HP/kW xx/xx.x at xxxxrpm
Low Idle RPM xxx RPM
Engine Code xxx
Displacement: 3.261L
EPA Cert. Family: xxxxxxxxxxxx
European Approval Number:
xxxxxxxxxxxx
Date of Manufacture xxxxxxxx
RKA19190

1.4.4 TRAVEL REDUCTION GEAR SERIAL NUMBER

The serial number is stamped on the plate positioned on the outer cover of the travel reduction gear.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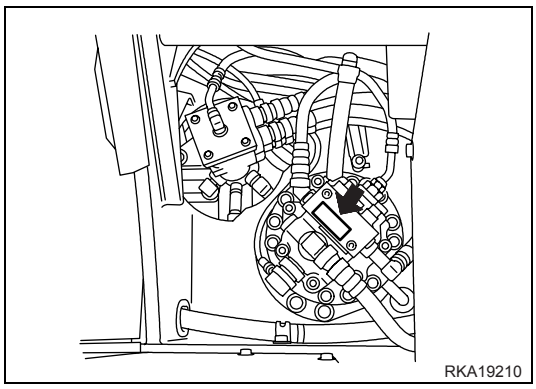
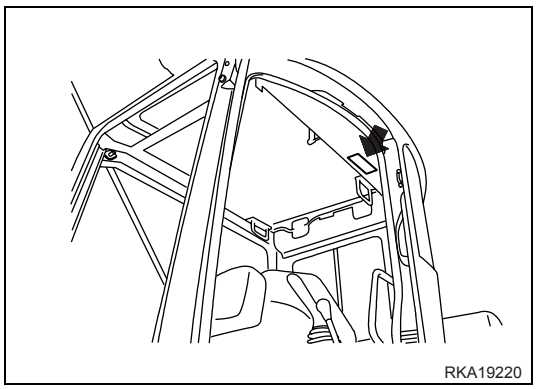
1.4.5 SWING REDUCTION GEAR SERIAL NUMBER

The serial number is stamped on the plate positioned on the upper side of the swing motor.



1.4.6 CAB SERIAL NUMBER

The serial number is stamped on the plate positioned on the upper left side.



1.4.7 SERIAL NUMBERS AND DEALER'S ADDRESS

Machine no.° _____ Model _____

Product identification number (PIN) _____

Engine no.° _____

Travel reduction gear no.° _____

Swing reduction gear no.° _____

Cab No. _____

Dealer:

_____

_____

_____

_____

Address: _____

_____

_____ Tel. _____

Contact person: _____

NOTES: _____

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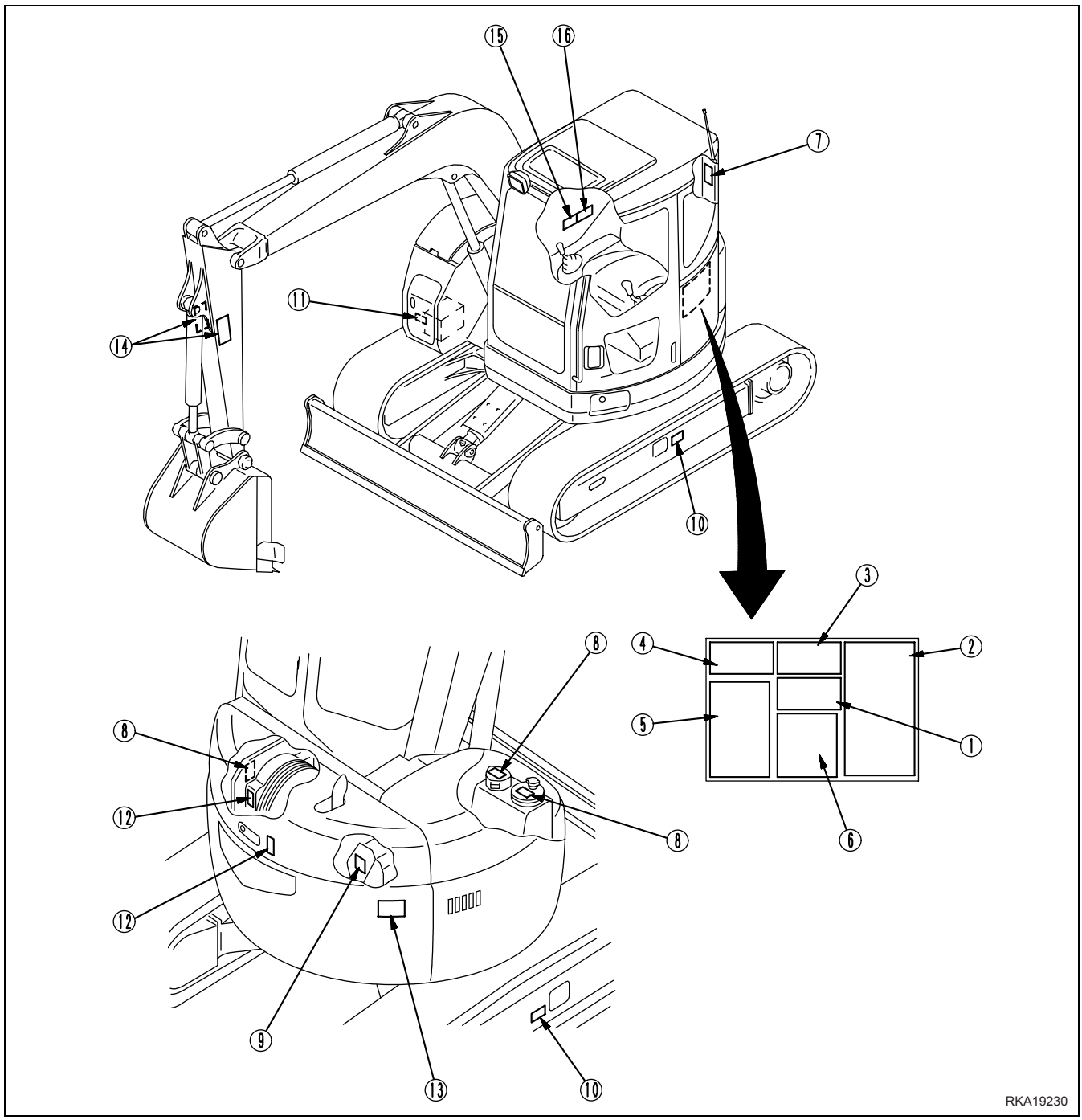
SAFETY AND ACCIDENT PREVENTION

2.1 SAFETY, NOISE AND VIBRATION PLATES

2.1.1 POSITION OF THE SAFETY PLATES

- The safety plates must always be legible and in good conditions; for this reason, if they are dirty with dust, oil or grease, it is necessary to clean them with a solution made of water and detergent.
  Do not use fuel, petrol or solvents.
- If the plates are damaged, ask for new ones to Komatsu or to your Komatsu Dealer.
- In case of replacement of a component provided with a safety plate, make sure that such a plate is applied also to the new part.
- The machine can be provided with other plates in addition to those indicated below; keep also to the instructions given in the additional plates, in any case.

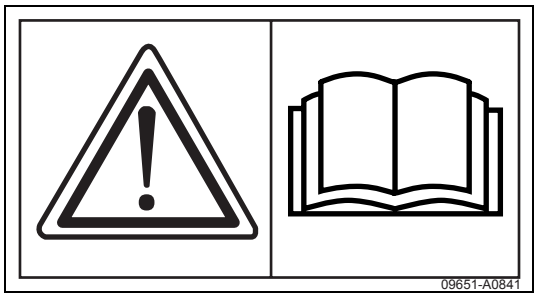


2.1.2 PICTOGRAMS AND RELEVANT MEANINGS

The warning and danger plates applied onto the machine include or are accompanied by pictograms.
The staff in charge with the operation and maintenance of the machine must be perfectly familiar with the symbols contained in the pictograms; the following list illustrates what they look like and their respective meanings.

1 - CONSULT THE MANUAL

- Carefully read the contents of the manual before using the machine or performing maintenance operations.

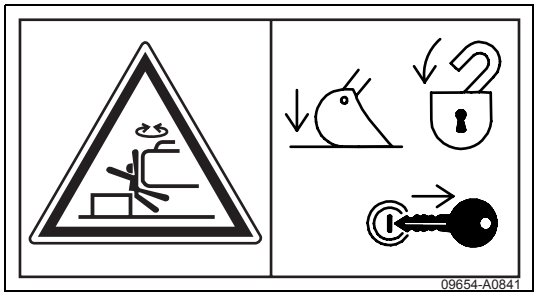


2 - SAFETY DISTANCE

- Do not get too near the machine and do not stand within its operating range.

3 - BEFORE LEAVING THE WORK POSITION

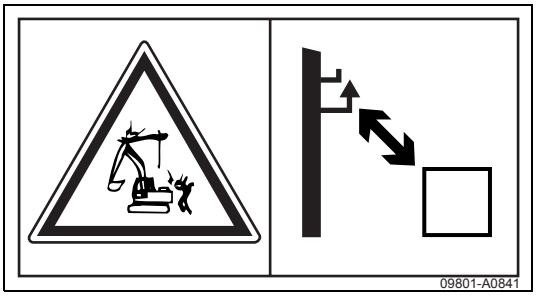
- Before leaving the machine, lower the work equipment to the ground, shift the safety lever to position “lock”, stop the engine and remove the ignition key.



4 - RISK OF ELECTROCUTION

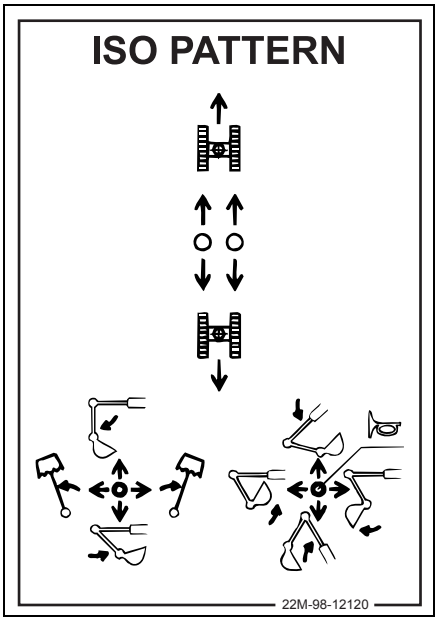
- Minimum safety distances from overhead lines.

Cable voltage	Min. safety distance
1.0 kV (distribution line)	5 m
6.6 kV (2–3 insulators)	5.2 m
33 kV (min. 3 insulators)	5.5 m
66 kV (min. 6 insulators)	6 m
154 kV (min. 10 insulators)	8 m
275 kV (min. 19 insulators)	10 m



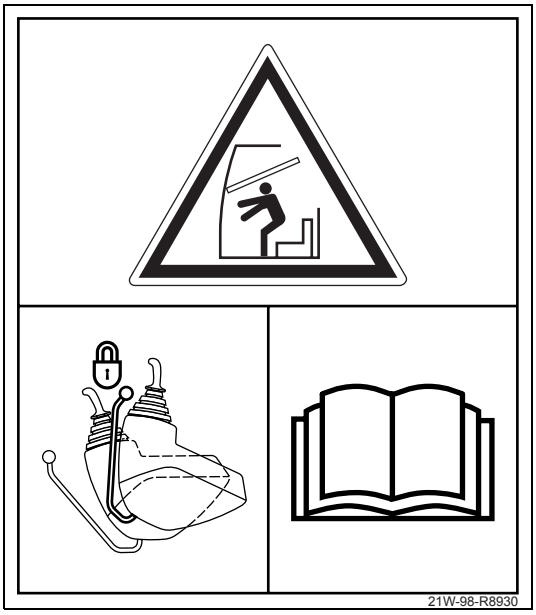
5 - ISO PATTERN

- Indicates the movements of the machine and of the work equipment.



6 – OPENING THE FRONT WINDSHIELDS

- To open or close the front windshields (upper and lower), stand up from the operator seat only after shifting the safety lever to position “lock”.
  If a control lever is inadvertently operated, the machine may move suddenly and cause serious accidents.



7 – LOCKING THE FRONT WINDSHIELD

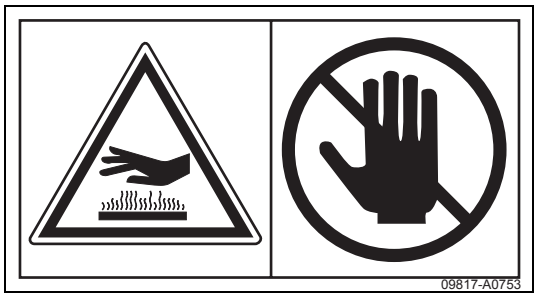
- Make sure that the front windshield is always locked.

8 - RISK OF BURNS

- Do not open the radiator and the hydraulic oil tank when the engine is still hot.

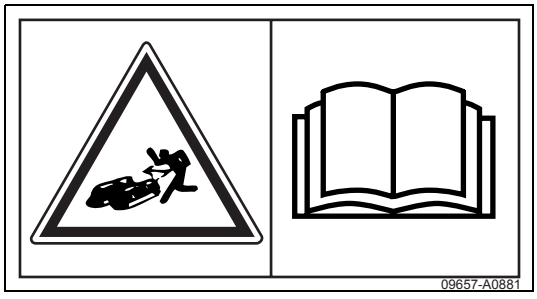
9 – HOT PARTS OF THE MACHINE

- Risk of burns in case of contact with hot parts like the engine or the exhaust silencer soon after the engine has been stopped.



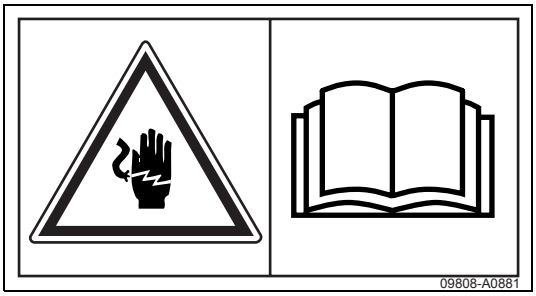
10 – ADJUSTING THE TRACK TENSION

- The adjustment of the tracks involves the risk of injuries. Keep to the instructions given in this manual.



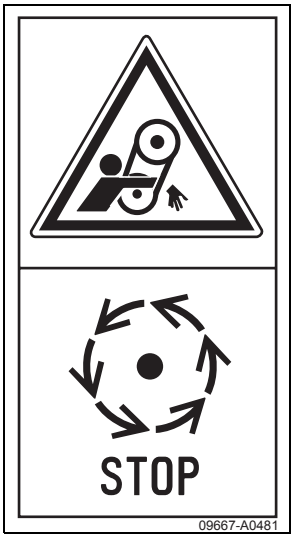
11 - BATTERY AND ELECTRIC CABLES

- Risk of electric charges in case of work on the battery or the electric cables.



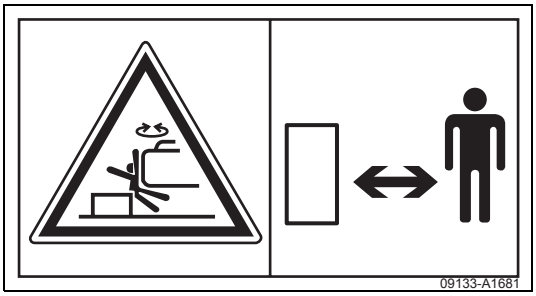
12 - DO NOT OPEN THE ENGINE HOOD

- Do not open or remove the hood when the engine is running.



13 - SAFETY DISTANCE

- Do not get too near the machine and do not stand within the turret swinging range.

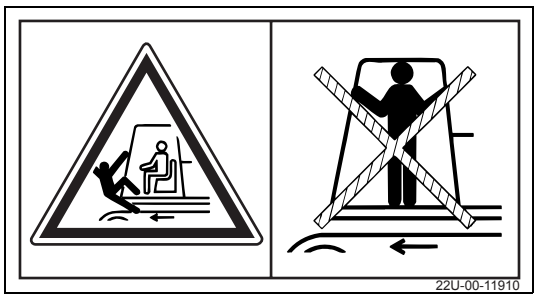


14 - WORK IN PROGRESS

- Do not approach or stand within the operating range of the equipment when it is lifted and under load.

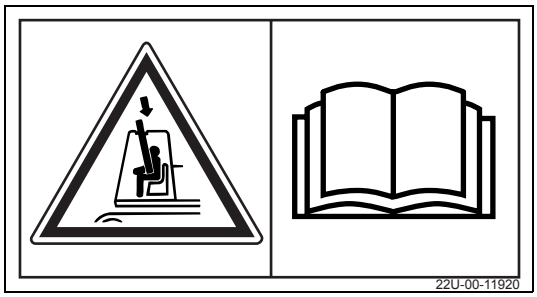
15 - DO NOT GET ON THE MACHINE

- Do not allow anyone to get on the machine while it is moving.



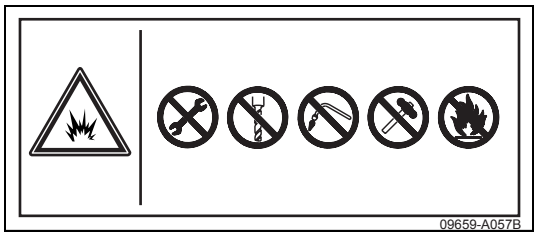
16 - FALLING OBJECTS

- Avoid working in places where there is the risk of falling objects. Contact your Komatsu Dealer for the installation of safety guards.



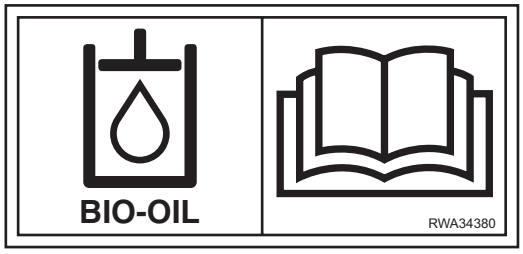
RISK OF EXPLOSION OF THE HYDRAULIC ACCUMULATOR

- Precautions to be taken for operations on the hydraulic accumulator.

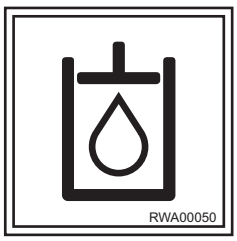


HYDRAULIC OIL TOPPING UP

- (Only for machines in which synthetic biodegradable oil type HEES is used)

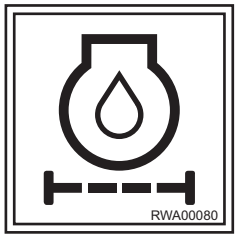


HYDRAULIC OIL TOPPING UP



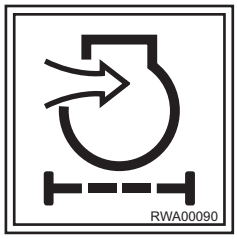
REFUELLING

ENGINE OIL FILTER



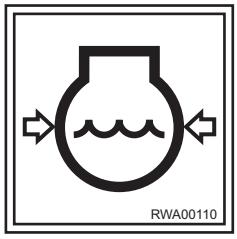
FUEL FILTER

ENGINE AIR INTAKE FILTER

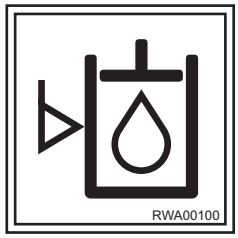


ENGINE COOLANT

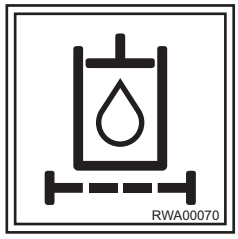
ENGINE COOLANT PRESSURE



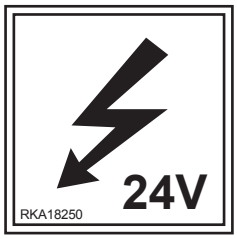
HYDRAULIC OIL LEVEL



HYDRAULIC OIL FILTER

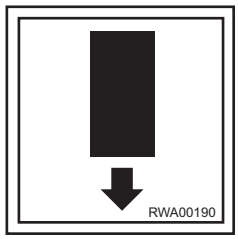


POWER OUTLET



ANCHORAGE POINT

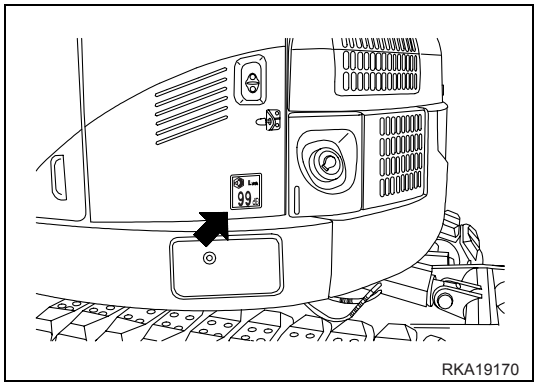
EMERGENCY EXIT

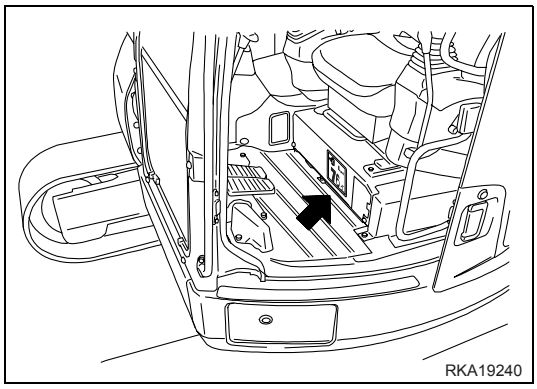


LIFTING POINT

2.1.3 POSITION OF THE NOISE PLATES

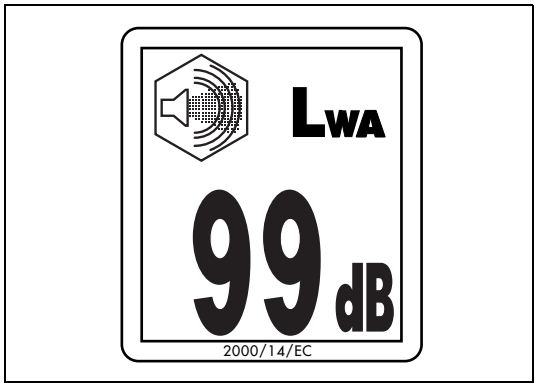
- The noise plates must always be legible and in good conditions; for this reason, if they are dirty with dust, oil or grease, it is necessary to clean them with a solution made of water and detergent.
  Do not use fuel, petrol or solvents.
- If the plates are damaged, ask for new ones to Komatsu or to your Komatsu Dealer.
- In case of replacement of a component provided with a noise plate, make sure that such a plate is applied also to the new part.





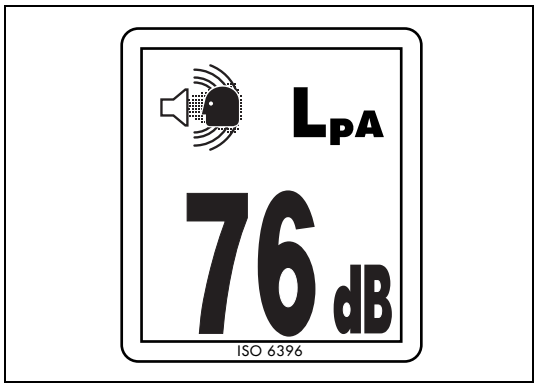
EXTERNAL NOISE

- This value indicates the noise level outside the machine and refers to the noise perceived by persons in the vicinity of the work area.



NOISE INSIDE THE CAB

- This value indicates the maximum noise level perceived by the operator's ears inside the cab when this is completely closed.



2.1.4 VIBRATIONS TO WHICH THE OPERATOR IS SUBJECTED

- According to the results of the tests carried out to determine the vibrations transmitted to the operator by the machine, the upper limbs are subjected to vibrations lower than 2.5 m/sq.sec., while the seated part of the body is subjected to vibrations lower than 0.5 m/sq.sec.

2.2 GENERAL PRECAUTIONS

2.2.1 SAFETY RULES

- Only trained and authorized staff can use the machine and perform maintenance operations.
- Follow all the safety rules, precautions and instructions when using the machine or performing maintenance operations.
- When working with other operators or when the work site is often occupied by other operators, make sure that everyone knows and understands all the agreed signals and, in any case, that everyone works in such a way as to be able to see the machine and to be visible to the operator.

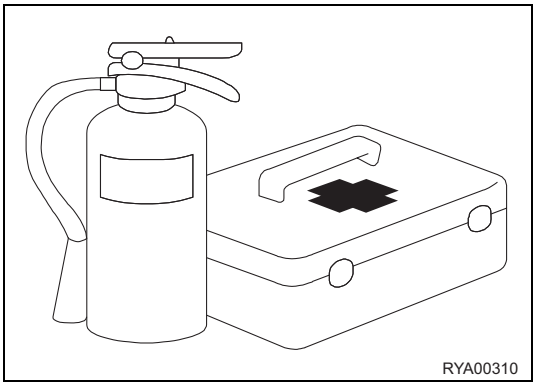
2.2.2 HOW TO BEHAVE IN CASE OF ANOMALIES

- If anomalies are observed while the machine is working or is being serviced (noise, vibrations, bad smells, incorrect measures, smoke, oil leakages, or any other anomaly indicated by the warning devices or the warning lights), inform the staff in charge, so that the necessary measures can be taken. Do not use the machine until such anomalies have been eliminated.

2.2.3 CLOTHING AND PERSONAL PROTECTION ITEMS

- Do not wear large or loose clothes, rings and watches, and do not approach the machine with loose long hair, since they can get entagled in the moving parts of the machine and cause serious injury or damage.
  Avoid also wearing clothes dirty with oil or fuel, since they are flammable.
- Wear a hard hat, goggles, safety shoes, mask, gloves and ear muffs when operating the machine or performing maintenance operations.
- Always wear safety goggles, a hard hat and heavy gloves if your job involves scattering metal chips or minute materials; these precautions are particularly useful when hammering the equipment connection pins and when blowing compressed air into the air filter and the radiator.
  During these operations, make also sure that no one is standing or working near the machine without the necessary protection items.
- When working for 8 hours with a noise level exceeding 90 dBA, it is necessary to use headphones or ear plugs and be particularly careful, especially at the end of the work shift.

2.2.4 FIRE EXTINGUISHERS AND FIRST AID KIT

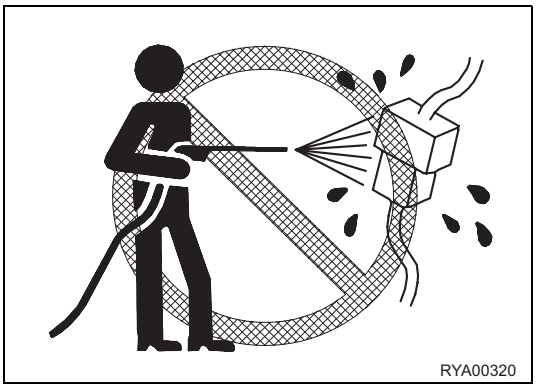


- Make sure that fire extinguishers have been provided and check their position.
- Periodically make sure that the fire extinguishers are loaded and that you know how to use them.
- Find out where the first aid kit has been placed.
- Periodically make sure that the first aid kit contains the necessary disinfectants, bandages, medicins, etc.
- It is necessary to know what to do in case of fire.
- Make sure that you have the phone numbers of the persons or structures you may need to contact in case of an emergency at hand (both at the worksite and where maintenance operations are performed).

2.2.5 SAFETY DEVICES AND GUARDS

- Make sure that all the guards and covers are in the correct position. Have guards and covers changed or repaired if damaged. Neither use the machine without guards, nor remove the guards when the engine is running.
- Always use the proper safety devices to lock the machine when parking; always fasten the seat belt.
- Do not remove the safety devices and always keep them in good operating conditions.
- Any improper use of the safety devices may result in serious injury or even death.

2.2.6 CLEANING THE MACHINE



- Spilled oil or grease, scattered tools or broken pieces are dangerous, because they may cause someone to slip or trip. Always keep the machine and the work site clean and tidy.
- To clean the machine, use a pressurized jet of warm water or steam and the specific detergents available on the market. Do not use diesel oil, oil or solvents, since the former leave an oily coat that favours the sticking of dust, while the latter (even if weak) damage the painted surfaces and therefore facilitate rusting.
- While cleaning the machine, keep the pressurized jet at a minimum distance of approx. 60 cm, in order not to damage the warning plates and the pictograms.
  If the plates are damaged, request Komatsu or your Komatsu Dealer to send you spare plates and change them.
- Water into the electrical system provokes the oxidation of the contacts and may hinder the start of the machine or even make it start suddenly and abruptly. For this reason, avoid using water or steam jets to clean sensors, connectors or the inside of the operator's cab.

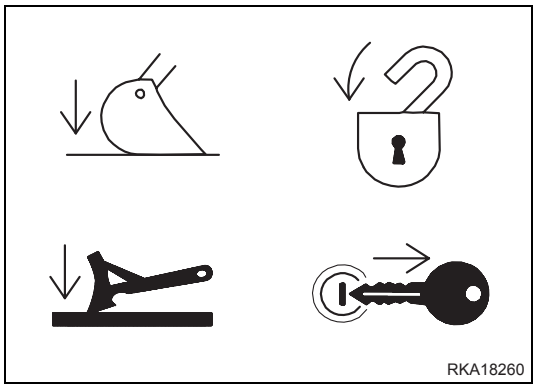
2.2.7 INSIDE OF THE CAB

- Before seating on the operator seat, remove any trace of mud or oil from the soles of your shoes. If the pedal is pressed with dirty shoes, these may slip on the pedal itself, thus causing serious accidents.
- Do not leave objects or tools scattered inside the cab.
- Do not apply suckers on the cab windows, since they may behave as lenses and cause fires.
- Do not use mobile phones inside the cab while driving or operating the machine.
- Do not introduce dangerous objects, for example flammable objects or explosives, inside the cab.
- Check the seat belt and change it if it is broken or damaged.
  Replace any component only with homologated parts available at Komatsu or its Dealers.

2.2.8 LEAVING THE OPERATOR SEAT

- When leaving the operator seat, even if temporarily, make sure that the machine is in a safe position. (See "2.3.2.8 PARKING THE MACHINE").
- Before leaving the operator seat, carry out the following operations in the sequence indicated below:

1. Lower the equipment to the ground.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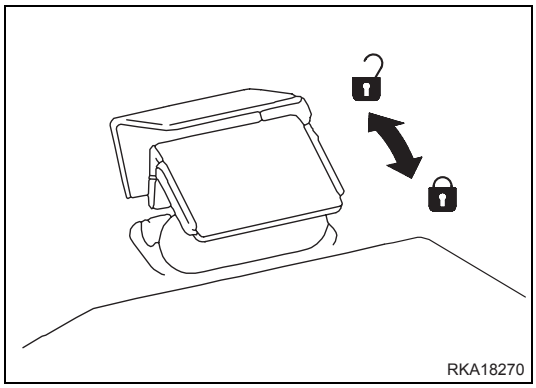
2. Engage the safety lock of the boom swing control.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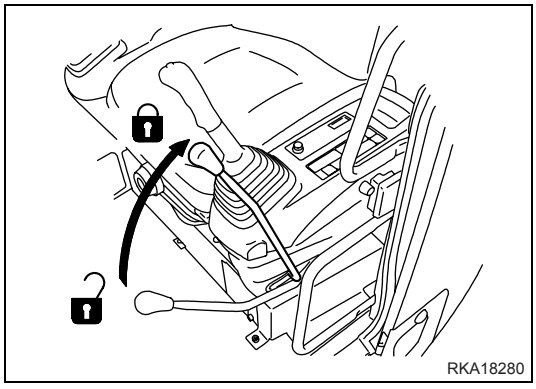
3. Lock the equipment control by shifting the safety lever to the “locked” position.
4. Stop the engine. (See "3.3.8 STOPPING THE ENGINE").
5. If you have to go so far away that you will not be able to see the machine, extract the ignition key.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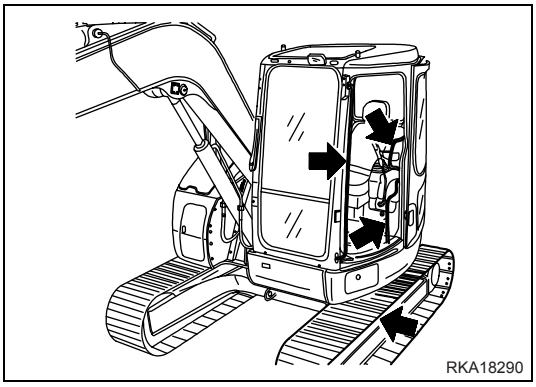
2.2.9 GETTING ON AND OFF THE MACHINE

- Do not jump on or off the machine, neither when it is at rest nor when it is moving.
- When getting on or off the machine, always use the handles and the tracks; get on and off the machine very carefully.
- Do not hold or rest on the control levers.
- Both when getting on and when getting off the machine, always maintain three points of contact (holding or resting points), in order to avoid losing your balance and falling down.
- Tighten the handle screws if they are loose, and clean the handles and tracks if they are dirty with oil or grease.
  Carefully clean the cab floor if it is dirty with oil, grease, mud or rubble.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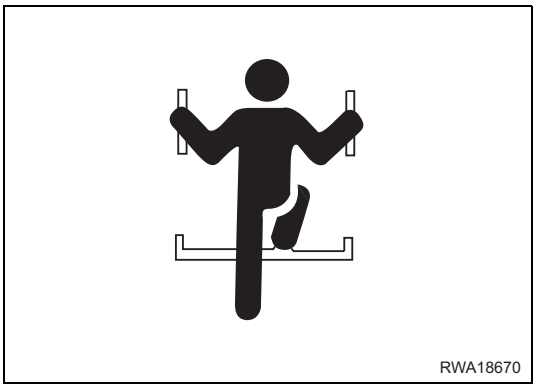
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2.2.10 IT IS FORBIDDEN TO CLIMB ON THE EQUIPMENT

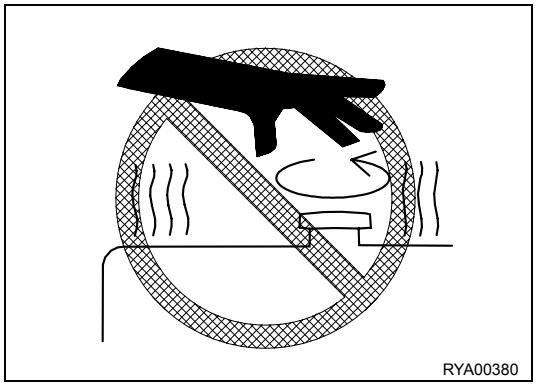
Do not allow anyone to climb on the bucket, the grapple forks, or other equipment. There is the risk of falling down and be seriously injured.

2.2.11 ARTICULATED PARTS

The free space around the work equipment changes depending on the movement of the articulated parts. Becoming entangled in the articulated parts may be the cause of serious injuries. Do not allow anyone to get too near rotating or telescopic parts of the machine.

2.2.12 PREVENTING BURNS

- If the engine coolant, the engine oil and the hydraulic oil are hot, use heavy cloths and wear gloves, heavy clothing and safety goggles before carrying out any check or touching the hot parts.
- Before checking the coolant level, stop the engine and let the fluid cool down.
  If a check is necessary due to the overheating of the engine, slowly loosen the radiator cap to release any residual pressure before removing it. The hot fluid that spurts out may cause serious burns.
- Before checking the engine oil and hydraulic circuit oil levels, stop the engine and let the oil cool down. The hot oil that can be sprayed out of the tank may cause serious burns.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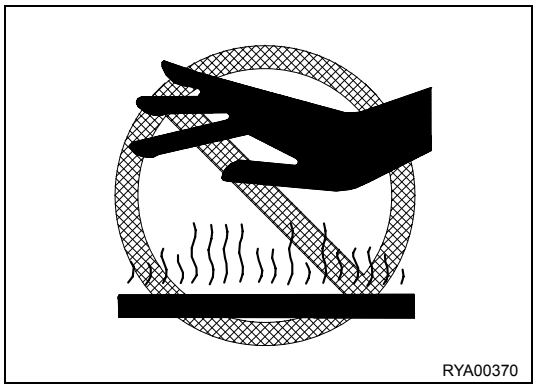
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2.2.13 PREVENTING FIRES DUE TO FUEL AND OIL

Fuel, oil and some types of antifreeze can easily ignite if they get in contact with a flame. Fuel is flammable and therefore very dangerous.

- Keep any naked flame away from flammable fluids.
- Stop the engine and do not smoke when refuelling.
- Refuel and add oil only after stopping the engine and in well ventilated places.
- Refuel and add oil in a well delimited area and do not allow unauthorized persons to approach.
- When refuelling, hold the fuel gun firmly and keep it constantly in contact with the filler until you have finished, in order to avoid sparks due to static electricity.
- After refuelling or adding oil, tighten the fuel or oil cap securely.
- Do not fill the tank completely, in order to leave room for the fuel to expand.
- In case some fuel is spilled, wipe it up immediately.

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2.2.14 HOW TO BEHAVE IN CASE OF FIRE

In case of fire, abandon the machine immediately, proceeding as follows.

- Turn off the ignition switch and stop the engine.
- Use the handles and tracks to get off the machine.

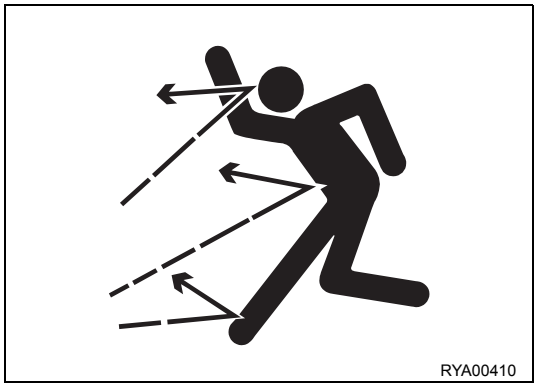
2.2.15 DETERGENT FOR THE WINDOWS

Use an ethyl alcohol based detergent. Methyl alcohol based detergents may irritate the eyes, therefore avoid using them.

2.2.16 PROTECTION AGAINST FALLING OBJECTS, FLYING OBJECTS, FOREIGN BODIES

In work places where there is the risk of objects or foreign bodies hitting or getting into the cab, it is necessary to take in consideration the conditions of use and to install guards suited to protect the operator.

- When carrying out demolition work, install a front guard and use a laminate covering on the front window.
- When working in mines or places where stones may fall down, install the FOPS (Falling Objects Protective Structure) canopy and a front guard and use a laminate covering on the front window.
- When carrying out the operations mentioned above, always close the front window. Furthermore, always make sure that anyone in the vicinity keeps a safety distance, and that he/she does not run the risk of being hit by falling or flying objects.
- The advice given above is based on the assumption that the machine works in standard operating conditions, but it may be necessary to add further guards depending on the specific conditions of the workplace. Contact your Komatsu Dealer for further advice on this matter.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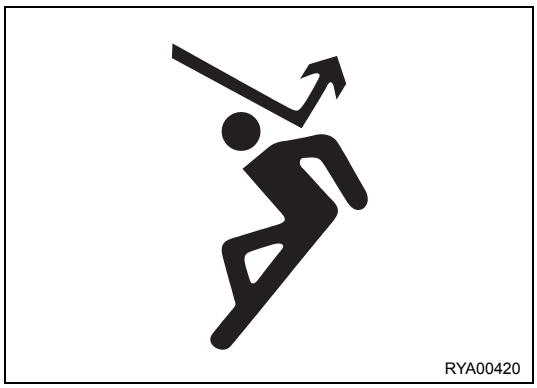
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2.2.17 PRECAUTIONS CONCERNING THE EQUIPMENT

- When installing and using optional equipment, carefully read the relevant manual and keep to the instructions given therein.
- Do not use optional or special equipment without the authorization of Komatsu or one of its Dealers.
  The installation and use of unauthorized equipment may create safety problems and adversely affect the efficiency and life of the machine.
- Komatsu cannot be held liable for any injury, damage or product failure resulting from the installation and use of unauthorized equipment.

2.2.18 COMBINING THE WORK EQUIPMENT

Depending on the type or combination of the equipment, this may hit the cab or other parts of the machine. Before using work equipment with which he is not familiar, the operator should check if there is the risk of interferences and proceed with care.

2.2.19 WORK LIGHT AND CAB LIGHTS

- Remove any trace of dirt from the lights, in such a way as to ensure perfect visibility on the work area.
- Make sure that all the lights are properly working. If necessary, change the faulty lamps with new ones, making sure that their power is correct.

2.2.20 CAB WINDOWS

- If a cab window breaks on the side facing the work equipment, this may hit the operator. Therefore, it is advisable to stop the machine immediately and to replace the broken glass.
- The roof window is made of organic glass (polycarbonate) and as such it can break if its surface is damaged, thus losing its protective function. If there is any crack or damage due to the fall of a stone, or if any trace thereof is observed, change it with a new glass.

2.2.21 PRECAUTIONS CONCERNING THE CAB STRUCTURE

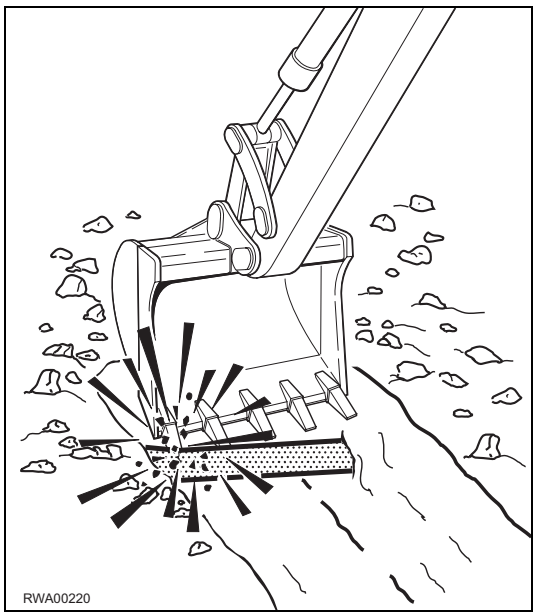
- If the cab is inadvertently hit or the machine overturns during work, the cab may be damaged with consequent reduction of its stiffness and of the safety that must be guaranteed to the operator.
  Contact Komatsu or an Authorized Komatsu Dealer to have the cab structure and resistance checked in case of impact or damage.

2.2.22 UNAUTHORIZED MODIFICATIONS

- Any modification made without the authorization of Komatsu can give rise to dangerous situations. Before making a modification, consult your Komatsu Dealer.
- Komatsu cannot be held liable for any injury, accident or failure due to modifications made without its express authorization.

2.2.23 SAFETY AT THE WORKPLACE

- Before starting the engine, thoroughly check the area for any unusual condition of the ground due to which work may be dangerous.
- Check the conditions of the ground at the work site and before starting the engine define the work plan and the best and safest operating procedure.
- Make the ground surface as level as possible before carrying out any operation.
- In case of work on the road, protect pedestrians and cars by designating a person for work site traffic duty and install fences around the work site.
- If water lines, gas lines, and telephone or high-voltage electric lines are located under the work site, contact the relevant utility company in order to find out their exact positions or to make them ineffective until the end of the operations. Be careful not to sever or damage any of these lines.
- Check the depth and flow of water before operating in water or on river banks.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2.2.24 WORKING ON LOOSE GROUND

- Avoid moving or using the machine near the edges of cliffs, overhangs and deep ditches. In these areas the ground may collapse. If the ground should collapse due to the weight or the vibrations of the machine, this runs the risk of falling down or overturning. It is important to remember that in these areas the ground is likely to collapse after heavy rains, explosions or earthquakes.
- When the machine works near river or lake banks or near ditches, its weight and vibrations may cause the ground to collapse. Before starting work, take all the precautions necessary to guarantee that the ground is safe and to prevent the machine from rolling or falling down.

2.2.25 PREVENTING ELECTROCUTION

- Digging operations near overhead electric lines are extremely dangerous and they may also cause death due to electrocution; for this reason, when working near overhead electric lines always respect the minimum safety distances prescribed by the competent authorities and by the accident-prevention rules in force.
- As far as underground long-distance lines are concerned, the minimum distance depends on the covering of the ducts in which the cables are laid.
- The basic safety precautions to be taken to prevent this risk are the following:

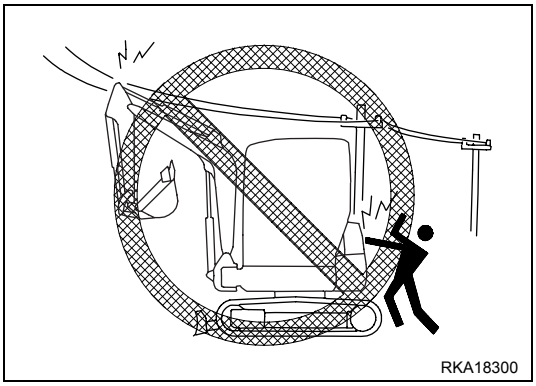
1. Wear shoes with thick rubber or leather soles.
2. Request the aid of another person who can warn you if the machine gets too close to the electric line.
3. Operate at low speed.
4. Get acquainted with the behaviour rules to be followed in case of electrocution.
5. Keep the phone number of the electricity company and of the nearest first aid station at hand.

- If the work equipment gets accidentally entangled in the cables, the operator must not leave the cab until the electricity company has insulated the line.
- When carrying out this kind of operations, warn everyone standing in the work area to keep a safety distance from the machine and the work equipment.
- Ask the electricity company in advance the voltage of the cables and the minimum safety distance.

⚠ DANGER

- **The minimum distances from overhead lines can vary in the different countries, according to the climate and to the humidity percentage in the air.**
  Indicatively, the distances indicated in the following table should be respected.

Cable voltage	Min. safety distance
1.0 kV (distribution line)	5 m
6.6 kV (2–3 insulators)	5.2 m
33 kV (min. 3 insulators)	5.5 m
66 kV (min. 6 insulators)	6 m
154 kV (min. 10 insulators)	8 m
275 kV (min. 19 insulators)	10 m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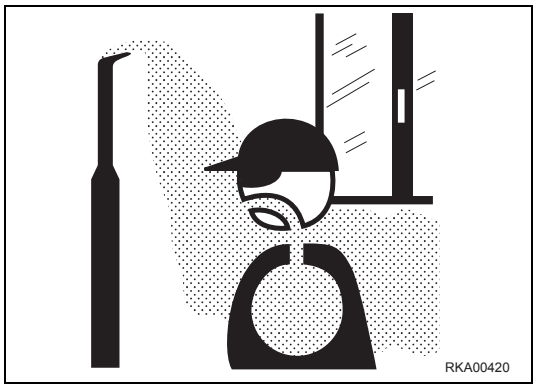
2.2.26 VISIBILITY

- Make sure that there are no people or obstacles in the area surrounding the machine and check the conditions of the worksite to ensure that all operations and movements can be carried out safely.
- Switch on the work lights as soon as visibility decreases.
- If visibility is reduced due to mist, smoke or heavy rain, stop the machine in a safe position and wait for the weather to improve until visibility becomes acceptable.

2.2.27 ROOM VENTILATION

- Before starting the machine in confined or poorly ventilated places, provide for proper ventilation or connect the engine exhaust pipe to a suction duct. The engine exhaust gases can be deadly.



2.2.28 CHECKING THE SIGNALS OF THE SIGNALMAN AND THE FIXED SIGNS

- Position signs to indicate the road edges and the fact that the ground may collapse. If visibility is not good, ask a colleague to direct you by making signals. The operators must pay the maximum attention to the signs and follow the instructions of the signalman.
- There can be only one signalman.
- Before starting work, make sure that all operators understand the meaning of the agreed signals and of the signs.

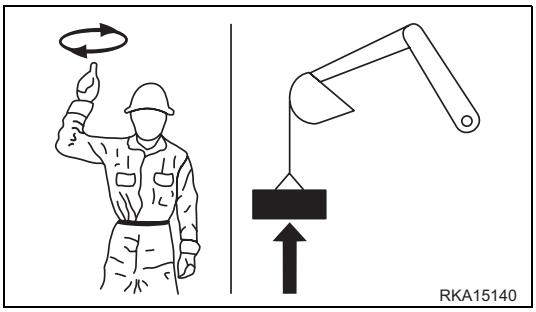
2.2.29 HAND SIGNALS

⚠ WARNING

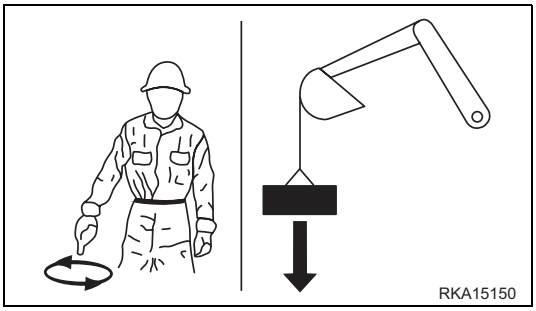
- **When it is necessary to position loads, make excavations or move the machine with reduced field of vision, the operator must be helped by another person standing on the ground and making signals to indicate the manoeuvres to be carried out, according to the specific signals defined by the relevant regulations.**
- **No movement or operation should be carried out if the signals have not been clearly understood by the operator and the signalman.**
- **When additional instructions different from those defined by the manual signalling system are necessary, these must be agreed upon by the operator and the signalman before starting the job.**
- **Only one person must be entrusted with making signals.**
- **The operator must make sure that the signalman is always within his field of vision and follow all his signals.**

The use of hand signals serves to direct the lifting, handling and positioning of the loads lifted by the work equipment. Hand signals can also be used during digging operations or when the machine travels, if the field of vision of the operator is reduced. The direction of movement of the hands and arms in relation to the machine must define the signal, independently of the position of the signalman. Hand signals must be performed following the indications given below.

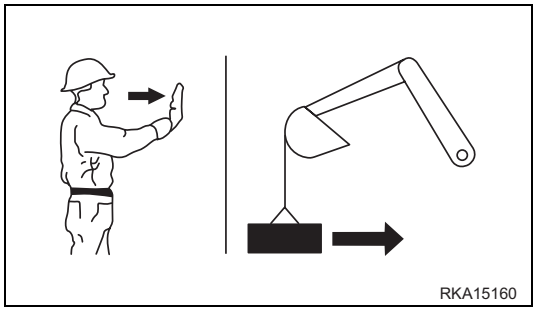
1 - LIFT THE LOAD VERTICALLY
With a forearm in vertical position and the forefinger pointing upwards, rotate the hand making small circles.



2 - LOWER THE LOAD VERTICALLY
With an arm extended and the forefinger pointing downwards, rotate the hand making small circles.



3 - MOVE THE LOAD AWAY IN HORIZONTAL DIRECTION
With an arm extended forwards and the hand in vertical position directed towards the load to be moved away, move the hand in the direction of the movement to be carried out.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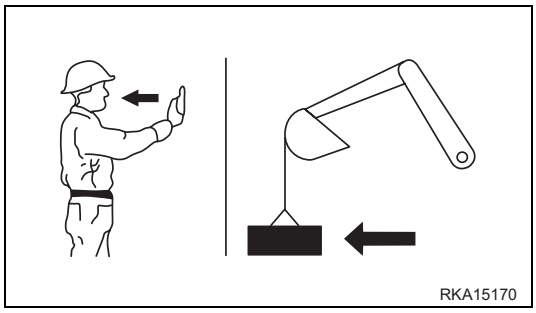
4 - BRING THE LOAD NEARER IN HORIZONTAL DIRECTION
With an arm extended forwards and the hand in vertical position directed towards the signalman, move the hand in the direction of the movement to be carried out.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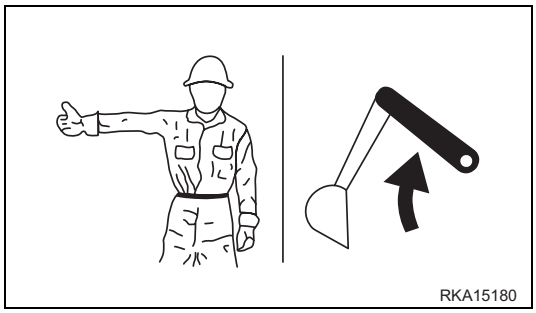
5 - LIFT THE BOOM
With an arm extended in horizontal position and closed fingers, point the thumb upwards.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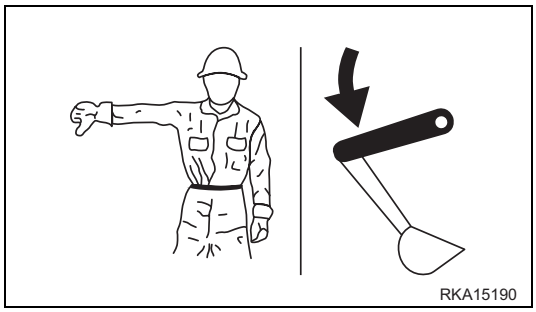
6 - LOWER THE BOOM
With an arm extended in horizontal position and closed fingers, point the thumb downwards.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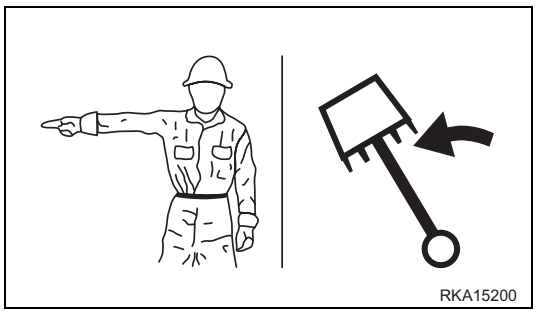
7 - SWING THE BOOM
With an arm extended in horizontal position, point the forefinger in the desired swing direction.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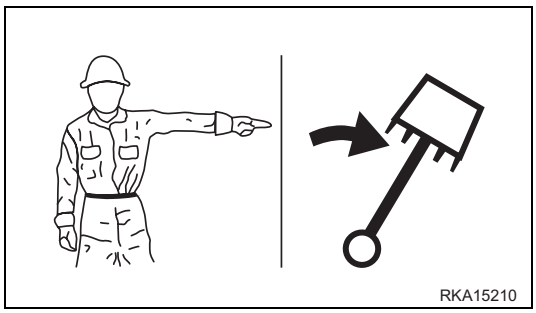
8 - SWING THE BOOM
With an arm extended in horizontal position, point the forefinger in the desired swing direction.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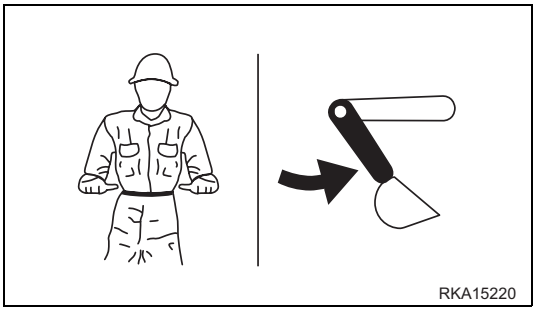
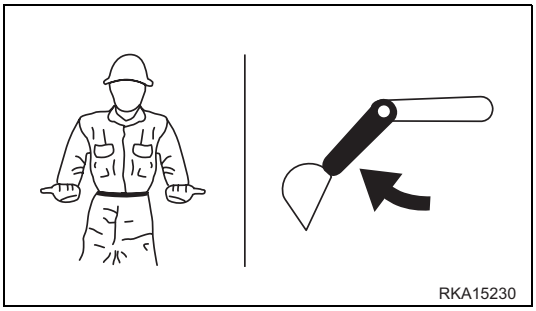
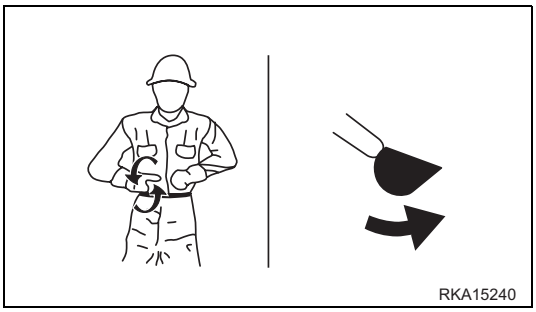
9 - FOLD THE ARM
With both hands clasped, point the thumbs inwards.



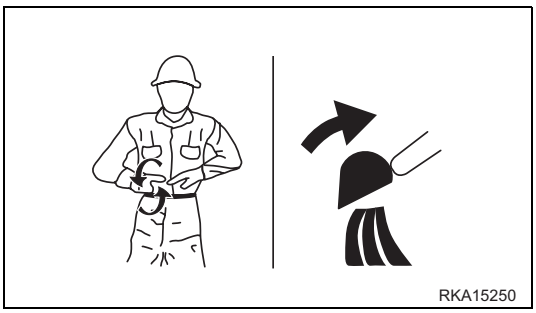
10 - EXTEND THE ARM
With both hands clasped, point the thumbs outwards.



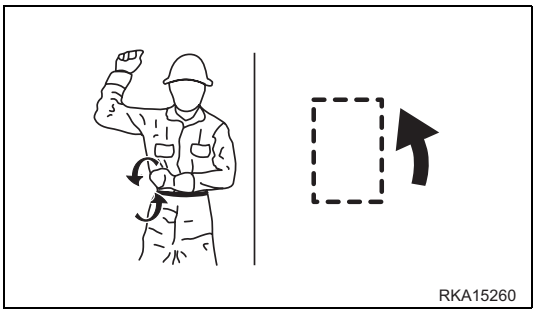
11 - FOLD THE BUCKET
Keep one hand still and closed. Rotate the other hand vertically with the thumb pointed towards the clasped hand.



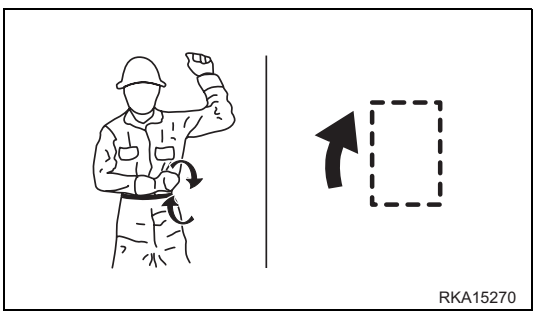
12 - OPEN THE BUCKET
Keep one hand still and open. Rotate the other hand vertically with the thumb pointed towards the open hand.



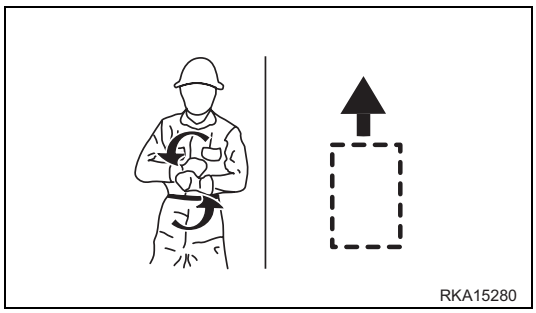
13 - TRAVEL WHILE STEERING
Lift the forearm corresponding to the inner steering side with clenched fist. Rotate the other fist vertically indicating the wheel's turning direction.



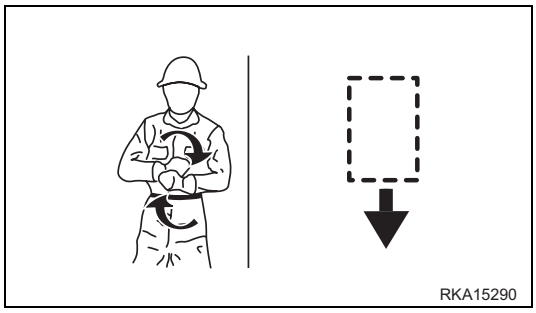
14 - TRAVEL WHILE STEERING
Lift the forearm corresponding to the inner steering side with clenched fist. Rotate the other fist vertically indicating the wheel's turning direction.



15 - TRAVEL STRAIGHT AHEAD
Rotate the fists vertically indicating the turning direction of the wheels.


RKA15280

16 - TRAVEL STRAIGHT AHEAD
Rotate the fists vertically indicating the turning direction of the wheels.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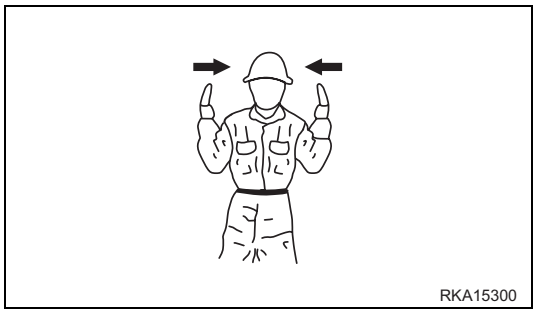
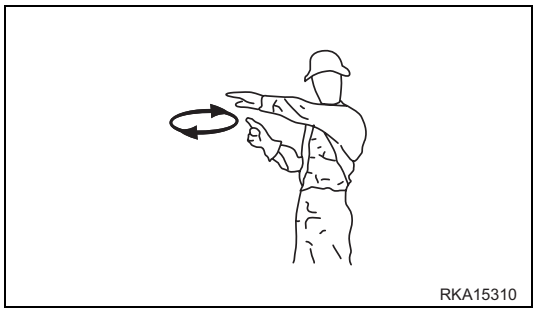
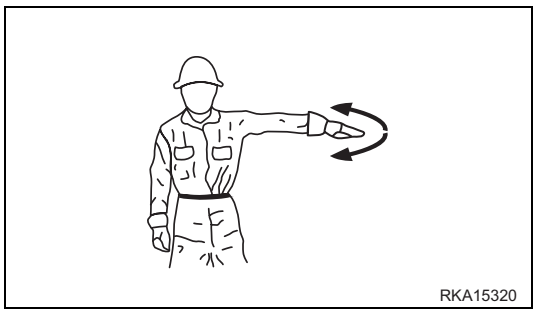
17 - DISTANCE TO BE COVERED
With the hands raised and facing inwards, move the hands laterally indicating the distance to be covered.


RKA15300

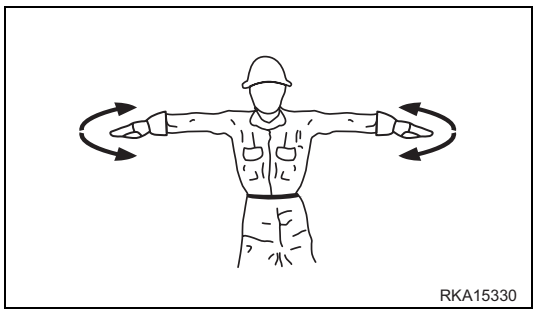
18 - CARRY OUT THE MOVEMENTS SLOWLY
One hand still in front of the hand that indicates the movement to be carried out. (The figure represents the “lift slowly” control).


RKA15310

19 - STOP
With one arm extended laterally, open the hand facing downwards and move the arm forwards and backwards.


RKA15320

20 - EMERGENCY STOP
With both arms extended in horizontal position, open the hands downwards and move both arms forwards and backwards.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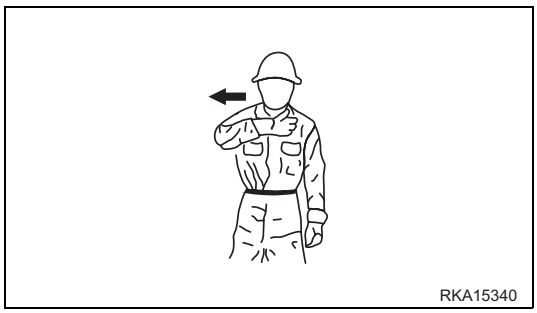
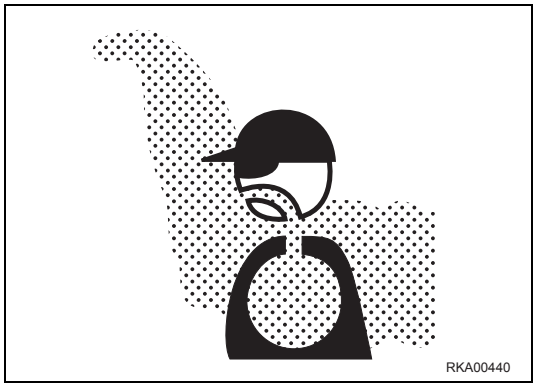
21 - STOP THE ENGINE
Pass thumb or forefinger across the throat.



2.2.30 EMERGENCY EXIT

- In case of emergency, if the cab door cannot be opened, use the hammer provided in the cab to break the glass and use the window as emergency exit.
  For further details, see "3.2.6 EMERGENCY EXIT HAMMER".
- When leaving the machine, remove the glass fragments from the window frame, in order to avoid being injured. Take care not to slip on the scattered glass fragments.

2.2.31 PREVENTING DAMAGE DUE TO ASBESTOS POWDER



If inhaled, the asbestos powder present in the air may cause lung cancer. There is the risk of inhaling asbestos powder when working in places where demolition work is carried out and when handling industrial waste. Always keep to the following instructions.

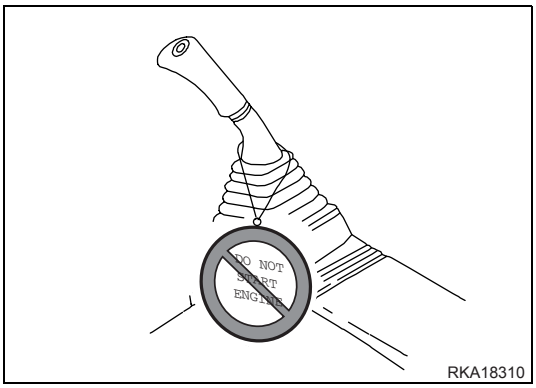
- If the material to be handled contains asbestos fibres, it is compulsory to make sure that all the laws and safety regulations in this regard are respected.
- If the regulations in force concerning work in environments contaminated by asbestos fibres are not complied with, it is forbidden to use the machine.
- Do not allow other people to approach during work.
- Always observe the rules and provisions in force at the workplace and the applicable environmental regulations.

No asbestos powder has been used for the construction of this machine but non-original parts may contain asbestos powder, therefore it is advisable to use always original Komatsu parts.

2.3 PRECAUTIONS FOR USE

2.3.1 BEFORE STARTING THE ENGINE

- If there is a warning plate hanging from the work equipment control lever, do not start the engine or touch the control levers.



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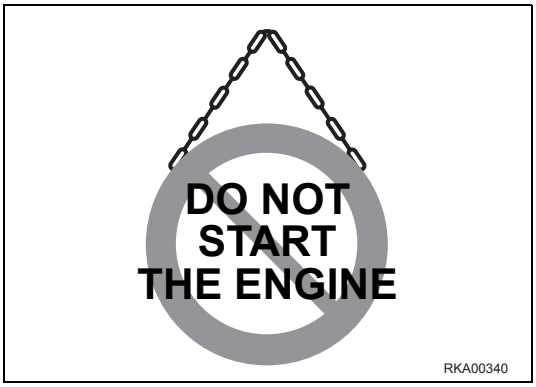

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2.3.1.1 CHECKS AND ADJUSTMENTS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

Carry out the checks listed below every day before starting the engine.

- Remove any trace of dirt from the window glass surface, in order to ensure good visibility.
- Remove any trace of dirt from the work lights and make sure that they come on correctly.
- Check the coolant level, the fuel level and the oil level in the pan, and make sure that the air filter isn't clogged and the wiring circuits aren't damaged.
- Adjust the operator seat selecting a position from which it is easy to carry out the required operations and make sure that the seat belt and the couplings are neither damaged nor worn out.
- Make sure that the indicators work properly, check the angle of incidence of the lights and make sure that all the control levers are in neutral position.
- Before starting the engine, make sure that the safety lever is in position "lock".
- Adjust the angle of the rear-view mirror, so that, seen from the operator seat, the lower rear part of the machine (which isn't usually visible due to the engine hood) can be seen without problems. For this adjustment operation, see paragraph "3.3.3.2 REAR-VIEW MIRRORS".
- Make sure that there are no persons or obstacles over, under or around the machine.

2.3.1.2 PRECAUTIONS TO BE TAKEN DURING THE START PROCEDURE

- When starting the engine, sound the horn as an alert signal.
- Start and operate the machine only when seated in driving position.
- Do not allow anyone apart from the operator to get on the machine.
- Do not short-circuit the starter circuit to start the engine. This operation is dangerous and will certainly damage the equipment.

2.3.1.3 PRECAUTIONS TO BE TAKEN IN COLD AREAS

- Perform the warming-up operation carefully. If the machine isn’t properly warmed up before operating the control levers, its response to the controls will be slow and this may cause unexpected accidents.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source, since the battery may catch fire.
  Before charging the battery or starting the engine with a different power source, let the electrolyte melt, then make sure that it isn't frozen any more and that there are no leakages.

2.3.2 PRECAUTIONS TO BE TAKEN WHEN WORKING

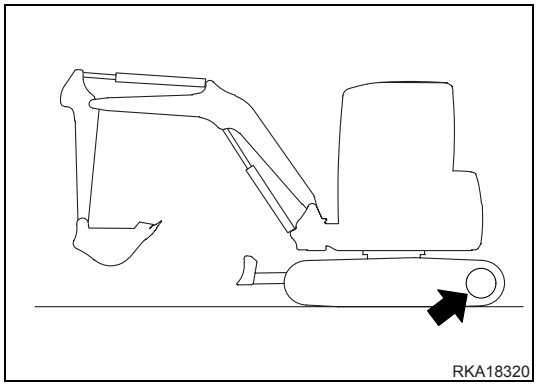
2.3.2.1 CHECKS AFTER STARTING THE ENGINE

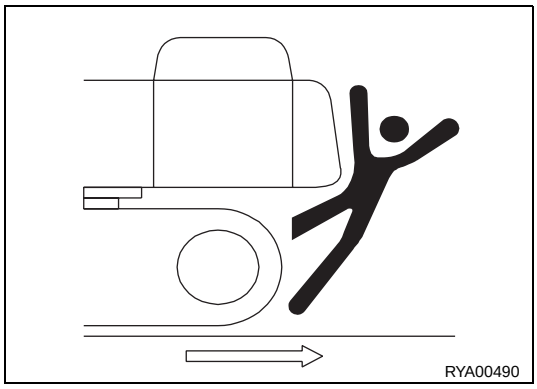
When performing checks, move the machine to a larger area, without obstacles, and proceed very slowly. Do not allow anyone to approach the machine.

- Make sure that the movements of the machine correspond to those displayed on the control decal. If they do not match, immediately replace the control decal with a correct one.
- Make sure that the indicators and the equipment work correctly and check also the operation of the bucket, boom, and arm, and of the travel, swing and steering systems.
- Make sure that there are no anomalies in the noises emitted by the machine, in the vibrations, temperatures, smells or in the operation of the indicators; also check that there are no oil or fuel leakages.
- If any anomaly is found, immediately provide for the necessary repairs.

2.3.2.2 PRECAUTIONS TO BE TAKEN WHEN CHANGING DIRECTION

- Before leaving, position the turret so that the sprocket is at the rear of the operator seat. If the sprocket is at the front of the operator seat, the machine will not carry out the movements selected with the control lever, but the opposite (for example, forward travel becomes reverse, left becomes right, etc). It is advisable to prevent the machine from performing these inverted movements.
- Before any movement, check again that there is no one in the surrounding area and that there are no obstacles.
- Before any movement, sound the horn to warn all the people standing nearby.
- Operate the machine only when you are seated in driving position.
- Fasten the seat belt securely.
- Do not allow anyone apart from the operator to get on the machine.
- Make sure that the travel alarm (optional) functions correctly.
- Always lock the cab door and windows in the desired position (open or closed).
- In workplaces where flying objects may get in the operator cab, make sure that the door and the windows are correctly closed.
- If behind the machine there is an area that is not visible, ask someone to stand there and make signals to direct your manoeuvres. Take care to avoid hitting other machines or people when steering or performing a rotation movement with the machine.


RKA18320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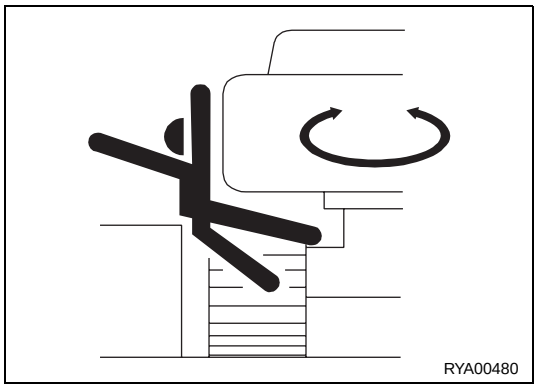
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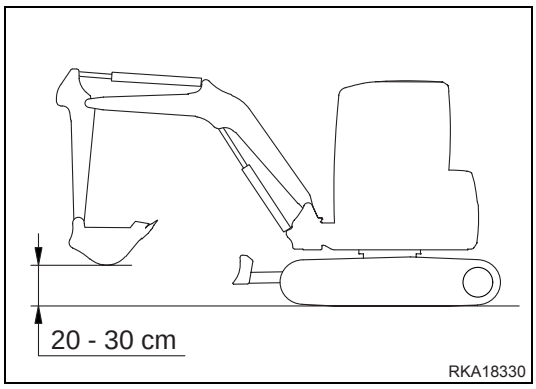
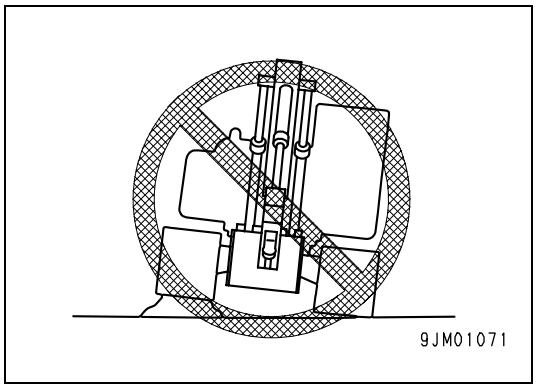
2.3.2.3 PRECAUTIONS TO BE TAKEN DURING TRAVEL

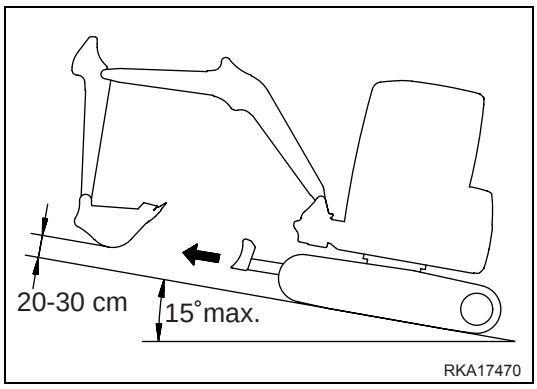


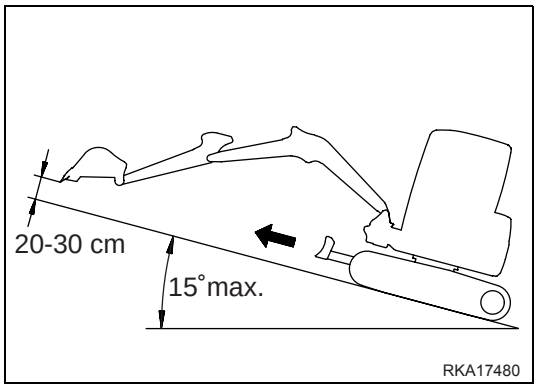


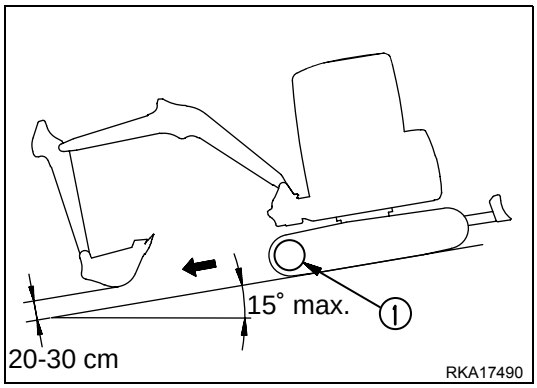
- It is dangerous to drive at excessive speed, to start or stop the machine suddenly or to steer abruptly.
- When moving on even surfaces, fold the work equipment and keep them at a height of
  20-30 cm from the ground.
- When moving on uneven surfaces, proceed slowly and avoid steering suddenly, since the machine runs the risk of overturning. The work equipment may hit the ground and cause the machine to lose balance, or may damage the machine itself or the structures present in the work area.
- If possible, avoid moving on obstacles. If the machine has to travel over an obstacle, keep the equipment as close to the ground as possible and travel at low speed.
  Never move on obstacles that may incline the machine considerably on one side.
- When travelling or working, always keep a safety distance from any persons, structures or machines, in order to avoid hitting them.
- When crossing a bridge or an elevated structure, first of all make sure that it is sufficiently sturdy to bear the weight of the machine. When travelling on public roads, check the conditions and characteristics of the route with the competent bodies and follow their instructions.
- When working in tunnels, under bridges, electric cables and wherever the height is limited, proceed slowly and take care to prevent the work equipment from hitting any obstacle.

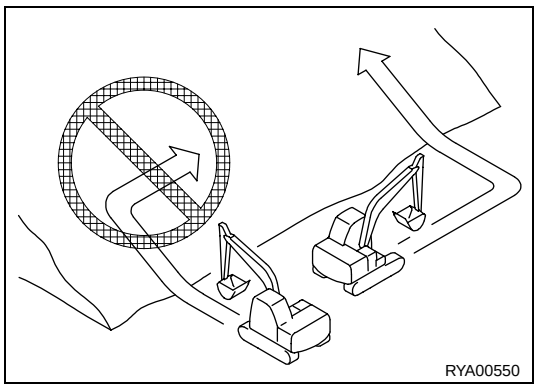
2.3.2.4 MOVING ON SLOPES

- Operations on slopes and on river or lake banks with damp ground may cause the machine to tip over or slip.
- On hills, banks or slopes, keep the bucket very close to the ground (20-30 cm from the ground), and in case of emergency quickly lower it to the ground to help the machine stop.
- When travelling up a steep slope, extend the work equipment forward to improve the balance of the machine, keep the work equipment approximately 20-30 cm above the ground, and travel at low speed.
- When travelling downhill, lower the engine speed, keep the travel lever close to the neutral position, and travel at low speed.
  When travelling downhill, position the machine with the turret rotated by 180°, so that the sprocket (1) and the boom are in travelling direction, as shown in the figure, and proceed at low speed.
- Do not change direction on slopes; side movements must be carried out on level ground, or with inclination not exceeding 10° .
- Do not move on slopes whose inclination exceeds 15°, since the machine may overturn.
- When the fuel level indicator reaches the red reserve area during work on a slope, immediately provide for refuelling; due to the inclination of the machine, the engine may suck in air and stop suddenly, which represents a grave risk for the safety of the operator and of the persons standing before the machine.
- If the engine stops suddenly, immediately lower the bucket to the ground.

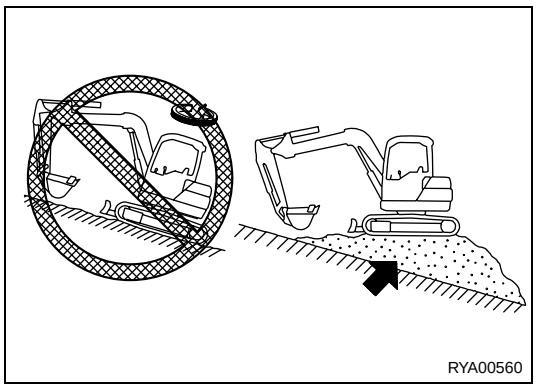






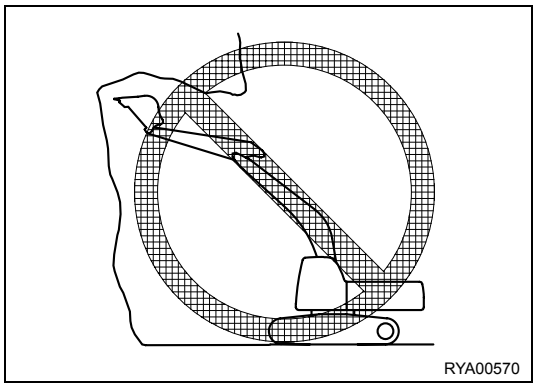


2.3.2.5 WORKING ON SLOPES

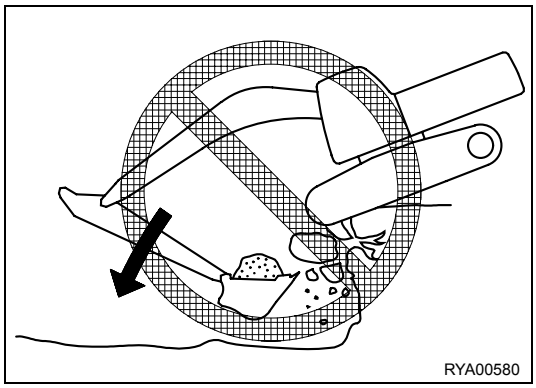


- Operations on slopes and on river or lake banks with damp ground may cause the machine to tip over or slip.
- When working on slopes (max. inclination 10°), avoid turning the turret, if possible, since this may cause the machine to lose balance and overturn.
  It is particularly dangerous to swing the equipment on slopes when the bucket is full.
  If these operations are going to last long, accumulate soil in such a way as to create a horizontal platform on which the machine can be positioned.

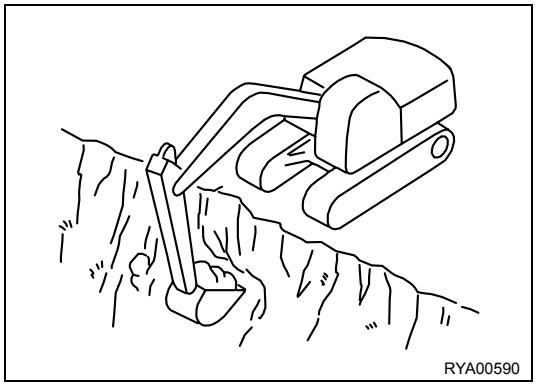
2.3.2.6 UNAUTHORIZED OPERATIONS



- Do not carry out excavations under overhangs. Stones may fall down or the overhang may collapse on the machine.

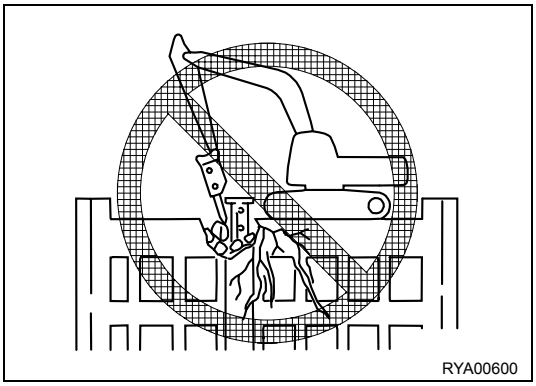


- Do not excavate too deeply under the front of the machine. The ground under the machine may collapse and cause the machine to fall.



- To make it easier to escape from the machine in case of emergency, set the tracks at right angles to the road shoulder or coast, with the sprocket at the rear, when carrying out digging operations.

- Do not carry out demolition work under the machine, since it may become unstable and tip over.
- When working on the top of buildings or other structures, check these structures and their strength before starting work. In fact, the buildings may collapse and cause serious injury or damages.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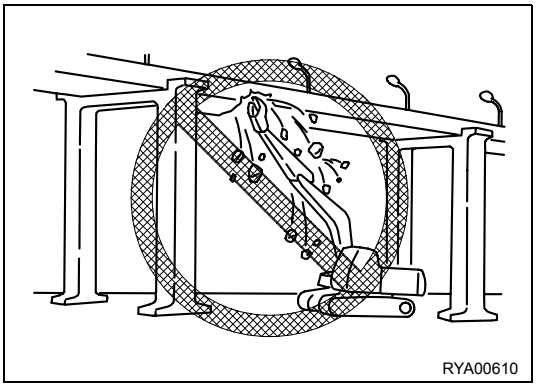
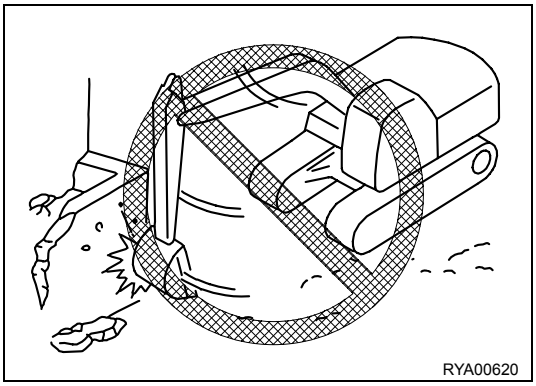
- When carrying out demolition work, do not position the machine under the structure being demolished, since broken parts may fall down or the building may collapse causing serious injury or property damage.


RYA00610

- Do not use the impact force of the work equipment for breaking work. Flying pieces of broken materials may damage the work equipment or even cause serious personal injury.
- As a general rule, the machine is more liable to overturn when the work equipment is swung to one side than when it is at the front or rear.


RYA00620

- When using a breaker or other heavy-duty equipment, the machine may lose its balance and overturn. Both when operating on flat ground and when operating on slopes, keep to the following instructions:

- Do not lower, swing, or stop the work equipment suddenly.
- Do not extend or retract the boom cylinder suddenly, since the impact may cause the machine to overturn.

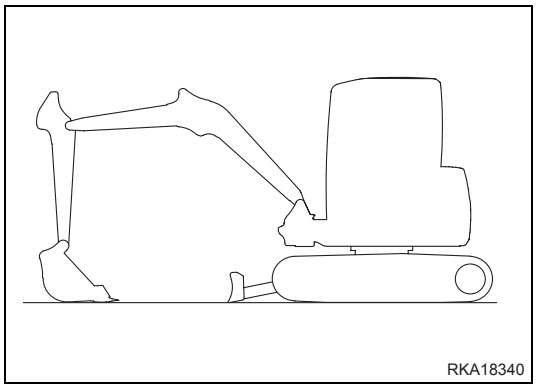
- Do not move the bucket over the head of other workers or over the operator seat of dump trucks or other transport equipment. The load may be spilled or the bucket may hit the dump truck and cause serious injury or property damage.

2.3.2.7 WORKING ON ICY OR SNOW-COVERED SURFACES

- Snow-covered or icy surfaces are slippery, therefore it is advisable to be very careful when travelling or using the machine. Do not operate the levers suddenly. Even a slight gradient may cause the machine to slip, therefore it is important to proceed with care when working on slopes.
- If the ground is icy, when the temperature increases it may collapse and cause the machine to overturn.
- If the machine gets into deep snow, it runs the risk of overturning or getting stuck in the snow. Take care to avoid moving away from the road edge and getting stuck in a heap of snow.
- During clearing operations, the road shoulders and any obstacle are buried under the snow and are not visible. The machine may lose stability or hit any obstacle or object buried under the snow, therefore always proceed with the utmost attention.

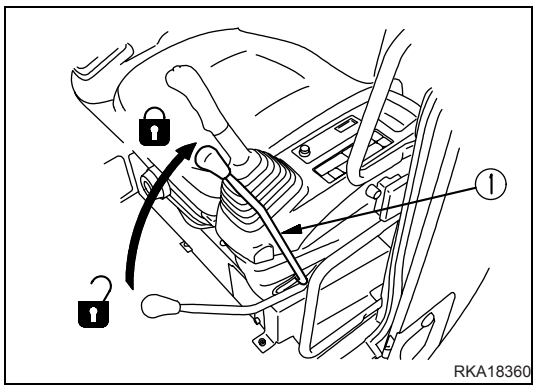
2.3.2.8 PARKING THE MACHINE

- Park the machine on firm and level ground.
- Choose a place where there is no risk of falling stones, landslips, or floods if the ground level is low.
- Lower the work equipment completely to the ground and stop the engine.


RKA18340

- When leaving the machine, shift the safety lever (1) to position “lock” , then stop the engine.
- Always lock the cab door, in order to prevent unauthorized persons from starting the machine. Always remove the key.
- If it is necessary to park on a slope, proceed as follows:

- Position the bucket facing downwards and then thrust it into the ground.
- Place wedges under the tracks to prevent the machine from moving.



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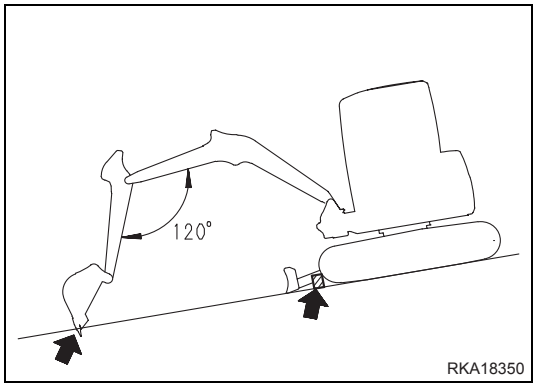

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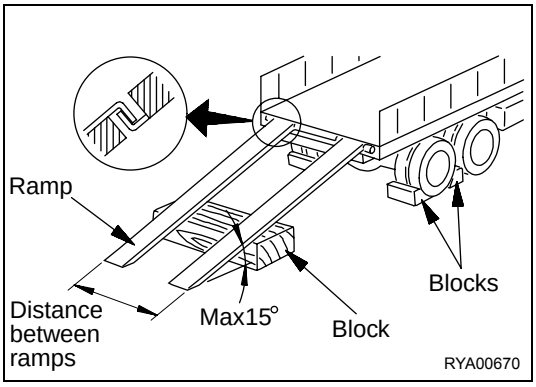
2.3.3 TRANSPORTING THE MACHINE

2.3.3.1 LOADING AND UNLOADING THE MACHINE



- Loading and unloading the machine on/from a motor vehicle always involves potential hazards. Proceed with extreme care.
- Perform loading and unloading operations on firm, level ground. Maintain a safety distance from the edges of ditches or from road sides.
- If the vehicles used are not specially equipped for this purpose, put support blocks under the ramps, in order to prevent them from bending.
- Always lock the wheels of the transport vehicle with wedges.
- Always use ramps that are sufficiently wide and can support the weight of the machine. The longitudinal axes of the ramps must be parallel to each other and perpendicular to the loading board, and their distance must be suitable for the tread of the machine.
- Make sure that the ramps are securely positioned and fastened to the loading board, and that they have the same length.
- Position the ramps with a maximum inclination of 15°.
- Make sure that the surface of the ramps is clean and there is no trace of grease, oil, soil or ice; remove dirt from the tracks before loading the machine on the vehicle.
- The machine must be loaded on the vehicle with the bucket directed forwards, that is, in the driving direction of the vehicle.
- Do not correct the trajectory of the machine on the ramps. If necessary, get down the ramps and start the operation again.
- If the machine is equipped with cab, always lock the door after loading the machine. Failure to carry out this operation may cause the door to open suddenly while the machine is being transported.
- After loading the machine, block the tracks with wedges and secure it with tie-downs or chains to prevent any sideward movement (see "3.4 TRANSPORTING THE MACHINE").

2.3.3.2 TRANSPORTING THE MACHINE

⚠ CAUTION

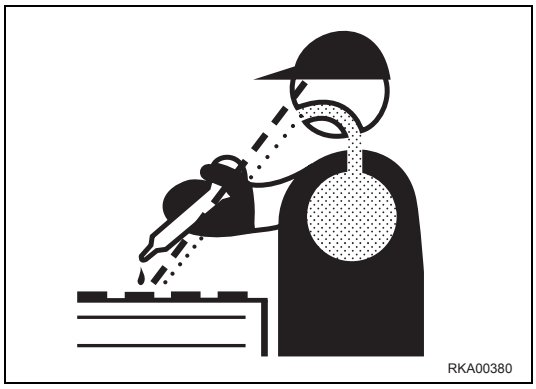
- **During transport, the machine must be secured to the vehicle.**

- Define the route to be followed, taking in consideration the width, height and weight of the transport means and of the machine.
  Make sure that the dimensions of the machine are compatible with the road and any gallery, subway, bridge, electric and telephone lines, etc.
- Keep to the regulations in force regarding the permissible width, height, weight of the machine and the transport speed.

2.3.4 BATTERY

2.3.4.1 PREVENTING RISKS THAT MAY BE DUE TO THE BATTERY

- Electrolytic batteries contain sulphuric acid, which can cause burns. It can also corrode clothing and make holes in it. In case of contact with battery acid, immediately wash the affected part with plenty of water.
- Battery acid may cause blindness if sprayed into the eyes. If acid gets accidentally into your eyes, flush them immediately with plenty of water and consult a doctor without delay.
- If you accidentally swallow battery acid, drink a large quantity of water or milk, beaten egg white or vegetable oil and in any case antiacid substances like magnesia, bicarbonate, etc., and call a doctor or a poison treatment center immediately.
- When handling batteries, always wear safety goggles.
- Batteries produce hydrogen, which is highly explosive and can easily ignite with small sparks or naked flames.
- Before working on the battery, stop the engine and remove the ignition key.
- Avoid short-circuiting the battery terminals through any contact, even if accidental, with metal objects or tools or by inverting them.
- Tighten the battery terminals securely. Loose terminals may generate sparks and may cause the battery to explode.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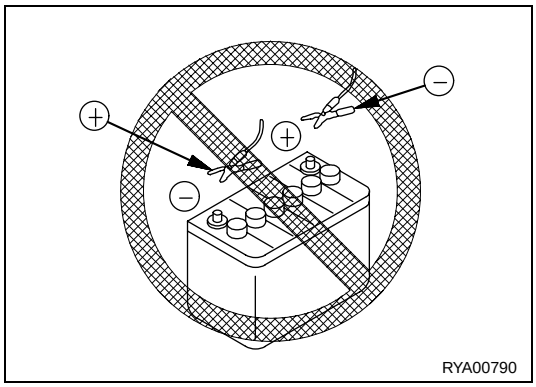
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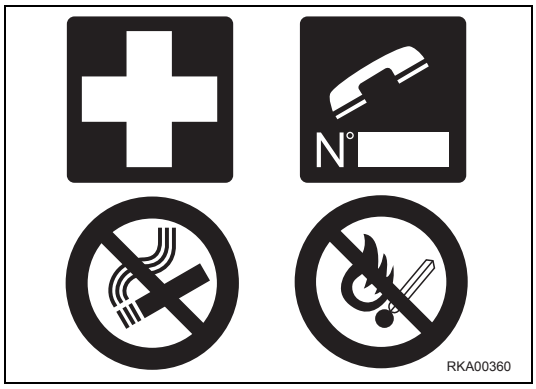
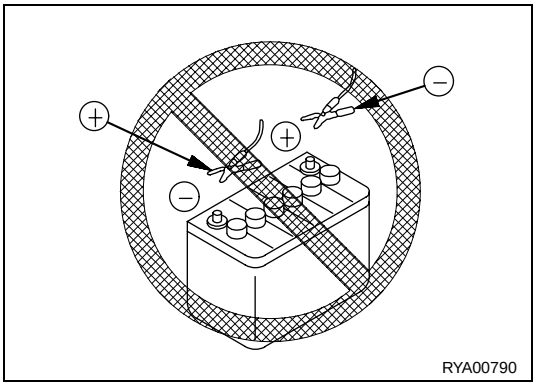
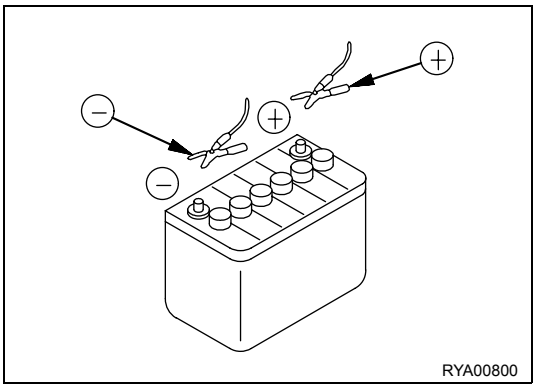


RKA00360

2.3.4.2 STARTING WITH BOOSTER CABLES

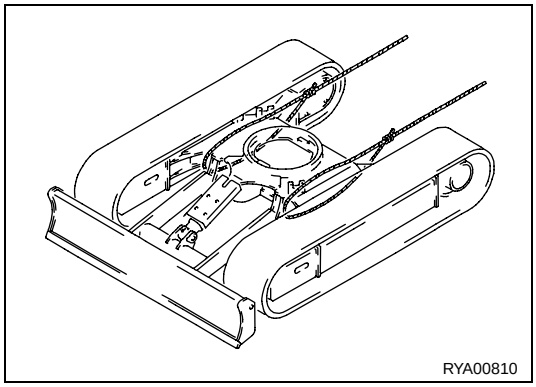
- When starting the machine with booster cables, always wear safety goggles.
- When starting the engine by means of another machine, avoid any contact between the two machines.
- When connecting the booster cables, make sure to connect the positive cable (+) first and then the negative or earth cable (–). After the start, disconnect first the negative or earth cable (–) and then the positive cable (+).
- Connect the batteries in parallel: positive to positive and negative to negative.
- When connecting the earth cable to the body of the machine to be started, operate as far as possible from the battery. (See "3.7.5 IF THE BATTERY IS DOWN").



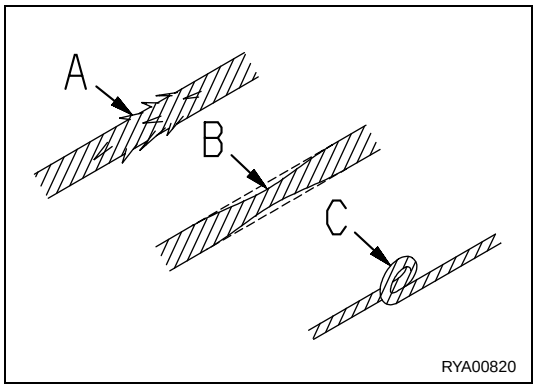


2.3.5 REMOVAL

2.3.5.1 PRECAUTIONS FOR THE REMOVAL


RYA00810

- Before removing the machine, make sure that all the controls are in neutral.
- Incorrect manoeuvres may cause serious damage, personal injury and even death.
- To move the machine, use properly dimensioned steel cables; do not use worn cables or cables with broken strands (A), deformed cables (B), twisted cables (C).
- During the removal, no one can be allowed to get near the machines or the cable.
- Do not stand astride the cable.
- Move the machine only as far as necessary to allow the required repairs to be carried out.
- Put wooden blocks between the towing cable and the machine body, in order to avoid wear or damage.
- Do not remove the machine in any way other than that indicated in paragraph "3.7.3 REMOVING THE MACHINE".



RYA00820

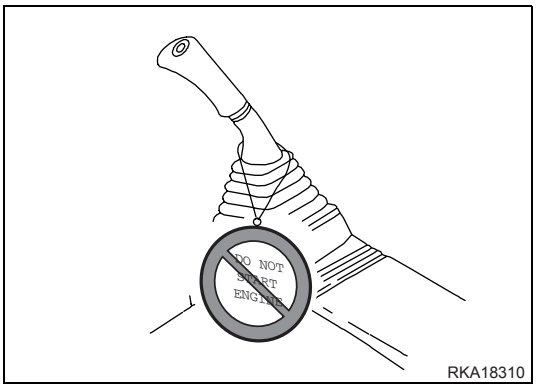
⚠ CAUTION

- **The maximum applicable force for the removal is F= 5000 kg.**
- **Use cables having the same length and draw continuosly and constantly, without jerks.**
- **Position and connect the machine to be removed taking care that it is on the same axis as the towing vehicle; the traction force exerted must be parallel to the axis of movement of the machine.**

2.4 PRECAUTIONS FOR MAINTENANCE

2.4.1 WARNING PLATES

- Before starting any maintenance operation, position the machine on a firm and level surface, lower the equipment to the ground, engage the safety locks of the equipment and the controls, and stop the engine.
- If another person starts the engine and operates the control levers while the operator is servicing the machine, this may result in serious injury or even death.
- To avoid these risks, always attach warning plates to the control levers and to the ignition key before performing any maintenance operation; if necessary, attach additional warning tags also around the machine and in particular to the cab door handles.



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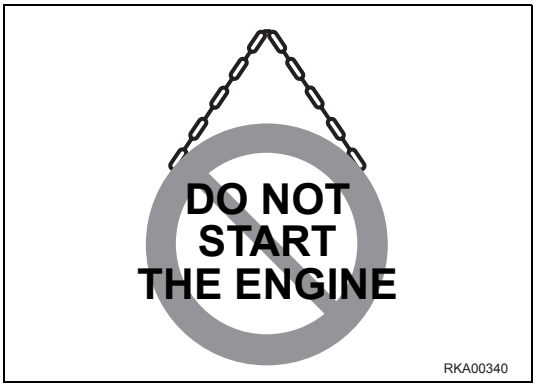


RKA00340

2.4.2 KEEP THE WORK PLACE CLEAN AND ORDERLY

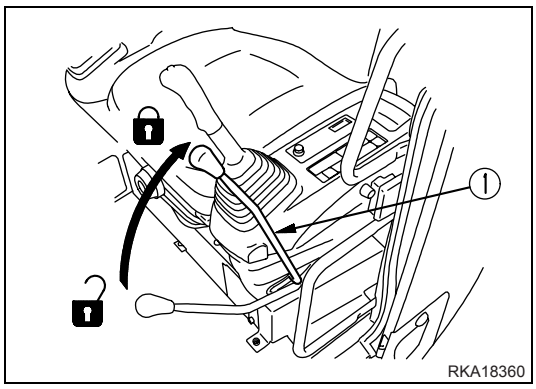
- Do not leave hammers or other tools lying around in the cab. Remove any trace of grease, oil or other substances that may cause the floor or the steps to become slippery. Always keep the cab clean and orderly, in order to be able to carry out any operation in total safety. If the cab isn't clean, the operator runs the risk of slipping, stumbling or even falling on the floor.
- To clean the roof window, which is made of organic glass (polycarbonate), use tap water and avoid using organic solvents. Organic solvents like benzene, toluene or methanol may cause a chemical reaction with glass, thus deteriorating the polycarbonate surface.

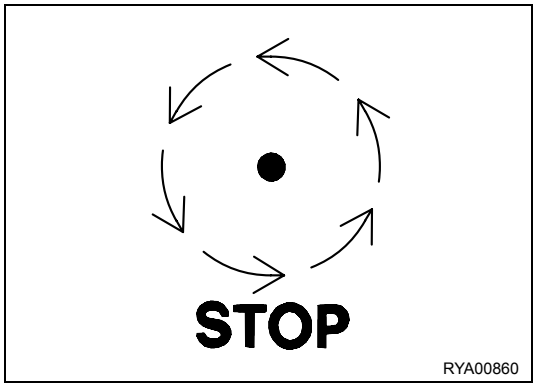
2.4.3 APPOINT A SUPERVISOR WHEN WORKING WITH OTHER PEOPLE

- When carrying out repairs on the machine, or when installing or removing the work equipment, appoint a supervisor and follow his/her instructions during work.
  When working with other people, any misunderstanding may cause serious accidents.

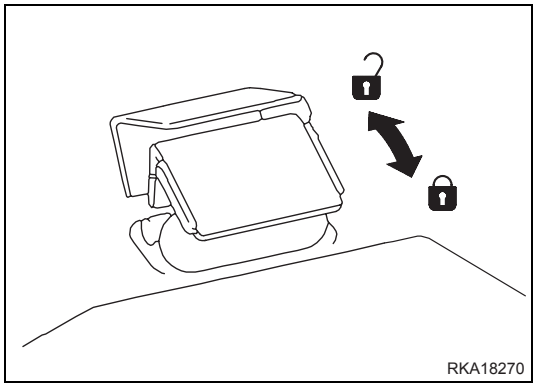
2.4.4 STOP THE ENGINE BEFORE CARRYING OUT ANY MAINTENANCE OPERATION OR INSPECTION

- Park the machine on firm and level ground.
- Choose a place where there is no risk of falling stones, landslips or floods.
- Lower the work equipment completely to the ground.
- Shift the work equipment control lever to neutral and the safety lever (1) to position “lock”, then stop the engine.

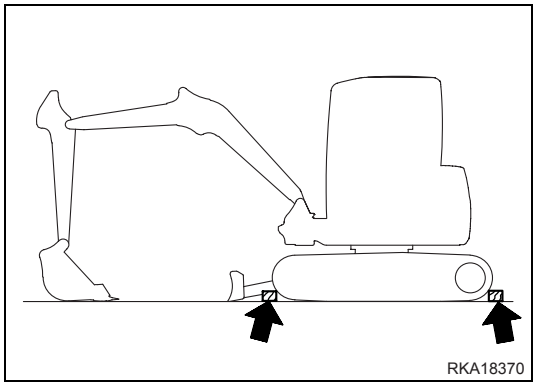




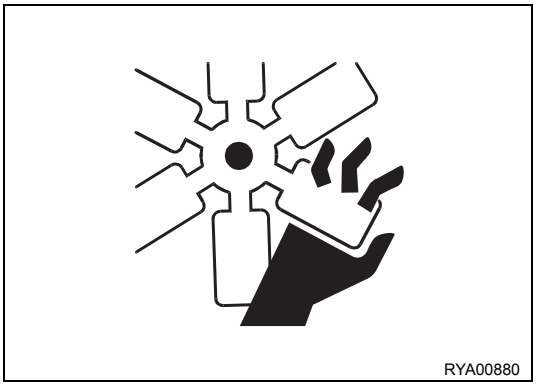
- Engage the safety device of the boom swing control and fit the turret swing safety pin.



- Place blocks under the tracks to prevent the machine from moving.

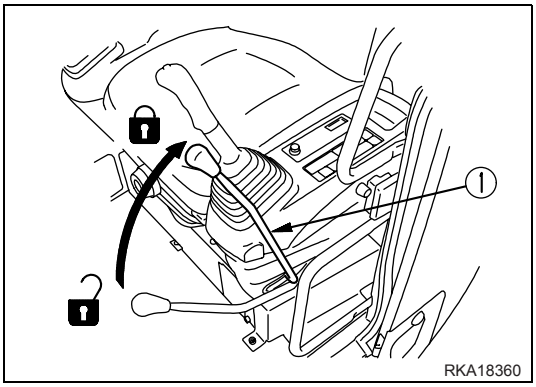


2.4.5 MAINTENANCE OPERATIONS TO BE CARRIED OUT WITH THE ENGINE RUNNING REQUIRE THE PRESENCE OF TWO OPERATORS


RYA00880

To avoid injuries, do not carry out maintenance operation with the engine running. Otherwise, the presence of two operators, who must proceed as indicated below, is required.

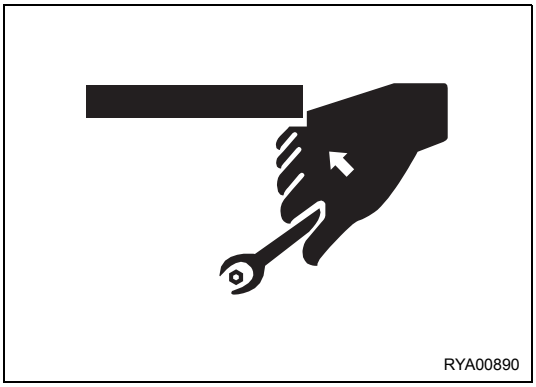
- One operator must always be seated in driving position and be ready to stop the engine at any moment. The operators must be constantly in contact with each other.
- Shift the safety lever (1) to position “lock”.
- When carrying out operations near the fan, the fan belt or other rotating parts, be careful to avoid getting entangled in these parts, and proceed very carefully.
- Do not touch any control lever. If it is necessary to operate a control lever, warn the other workers so that they can move to a safer place.
- Be careful to avoid introducing or letting tools or other objects fall in the fan or the fan belt. Some parts may break or be ejected.



RKA18360

2.4.6 TOOLS

Use only tools that are suitable for the job at hand and make sure to use them in the correct manner. The use of damaged, low-quality, faulty or unsuitable tools, or the incorrect use of the tools may cause serious injuries.


RYA00890

2.4.7 HYDRAULIC ACCUMULATOR

RKA12540

The hydraulic accumulator contains pressurized nitrogen.
When carrying out any operation on the accumulator, do not proceed carelessly, since this may cause an explosion and consequently serious injury and even death. For this reason, keep to the following instructions:

- do not remove the accumulator;
- do not bring the accumulator near sparks or naked flames;
- do not make holes in the accumulator, do not weld or use oxy-hydrogen flames;
- do not hit or press the accumulator;
- when disposing of the accumulator, take care to release the gas it contains. Have this operation carried out only by a Komatsu Dealer.

2.4.8 MAINTENANCE STAFF

Maintenance and repairs must be carried out exclusively by authorized personnel. Do not allow unauthorized personnel to go near the machine. If necessary, ask another worker to check the area.

2.4.9 EQUIPMENT

- Appoint a supervisor before starting to remove or install the equipment.
- Position the equipment that has been removed from the machine in a safe place, in order to prevent it from falling down. Take the measures necessary to prevent unauthorized people to approach the area where the equipment has been stored.

RYA00910

2.4.10 WORKING UNDER THE MACHINE

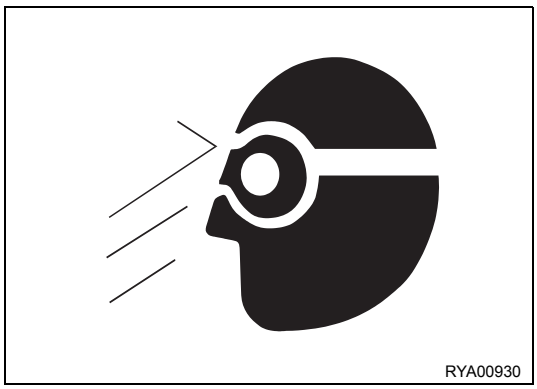
- If it is necessary to carry out maintenance operations or repairs under the work equipment or under the machine, support the equipment and the machine with blocks and supports suitable for bearing their weight.
- It is extremely dangerous to work under the machine if the tracks are raised from the ground and the machine is supported only by the work equipment. If one of the control levers is accidentally operated or in case of anomalies in the hydraulic pipes, the work equipment or the machine may lower suddenly. This is extremely dangerous, therefore it is important to avoid working under the equipment or the machine.

RYA00920

2.4.11 NOISE

If the noise emitted by the machine is too loud, it may cause temporary or permanent hearing damage.
When servicing the engine, which means being exposed to considerable noise for long periods, wear headsets or ear plugs.

2.4.12 PRECAUTIONS TO BE TAKEN WHEN USING THE HAMMER


RYA00930

When the hammer is used, the pins may come off and metal parts may be pushed out causing serious injuries. Always proceeds as follows.

- If rigid metal parts, like pins, bucket teeth, cutting edges or bearings are hit by a hammer, some pieces may come off and cause serious injuries. Always wear safety goggles and gloves.
- When the bucket pins or teeth are hit, the broken parts may be thrust in the air and cause injuries to the people in the vicinity. Always make sure that there is no one around.
- If the pins are hit with force, these may move suddenly and cause injuries to the people standing nearby.

2.4.13 REPAIR WELDS

Welding operations must be always carried out by a qualified welder, in a place where suitable equipment is available. Welding operations may be the cause of fire and electrocution, therefore do not allow unauthorized personnel to make welds.

2.4.14 RULES TO BE FOLLOWED WHEN REFUELLING OR ADDING OIL

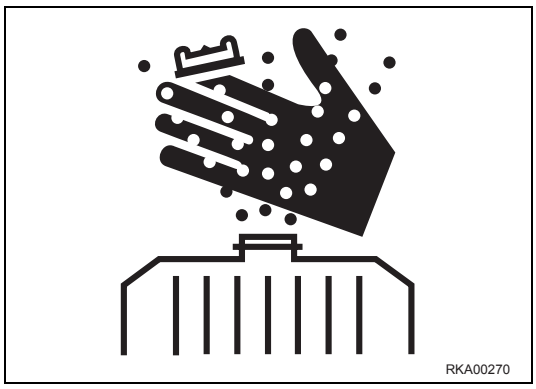
RKA00320

- Keep away from naked flames while refuelling or adding oil.
- Spilled fuel or oil make the ground slippery and may cause accidents; clean any dirty area immediately and carefully.
- Always tighten the safety caps of the fuel tank and of the hydraulic oil tank securely.
- Do not use fuel to clean any part of the machine that is dirty with oil or dust.
- Always top up the fuel and oil tanks in properly ventilated areas and refrain from smoking.
- When refuelling, hold the fuel gun firmly and keep it constantly in contact with the filler until you have finished, in order to avoid sparks due to static electricity.
- Do not fill the tank completely, in order to leave room for the fuel to expand.

RKA00310

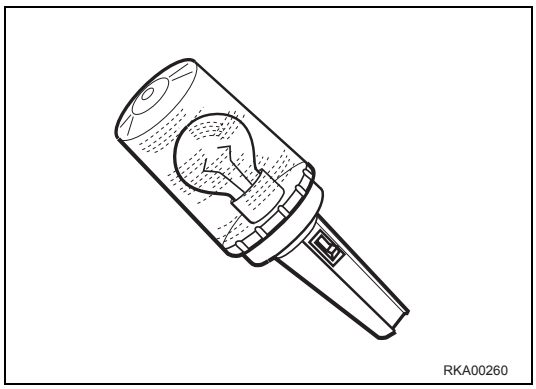
2.4.15 CHECKING THE COOLANT LEVEL IN THE RADIATOR

- Let the engine and the radiator cool down before checking the coolant level.
- If it is necessary to remove the cap with hot engine, wear suitable clothes and protections and loosen the cap slowly, in order to release the pressure gradually.


RKA00270

2.4.16 USING LAMPS

- When checking the fuel, oil, coolant or battery electrolyte level, always use homologated explosion-proof lamps.
  If such lamps are not used, there is danger of fire or explosion.

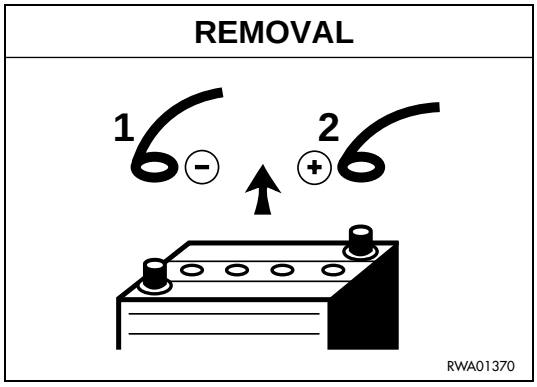

RKA00260

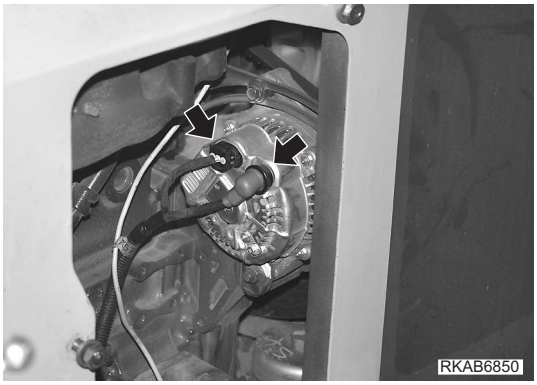
2.4.17 PRECAUTIONS TO BE TAKEN WHEN HANDLING THE BATTERY AND THE ALTERNATOR

- When carrying out repairs on the electric system or electric welding operations, remove the negative terminal (-) of the battery to prevent the passage of current.

IMPORTANT

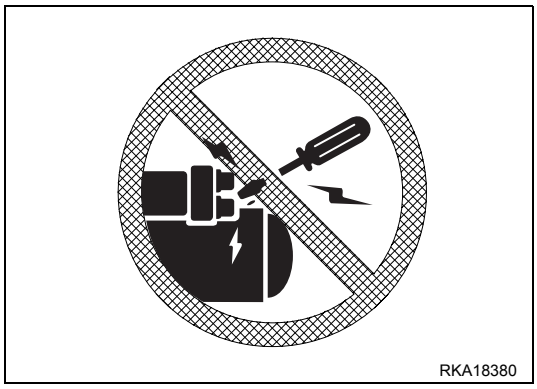
- **Disconnect first the negative earth cable (–) and then the positive cable (+).**
  At the end of the operation, reconnect first the positive cable (+) and then the negative cable (–).
- If electric welding operations are to be carried out on the machine, it is necessary to disconnect the battery and also the alternator.

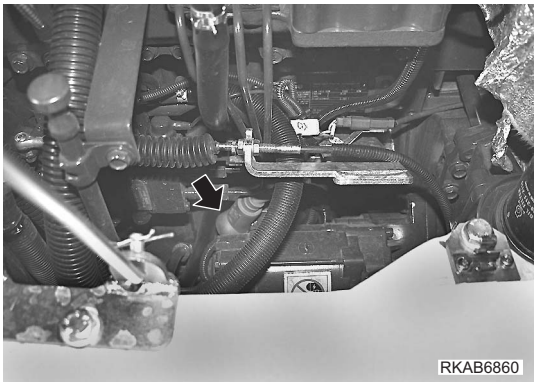




2.4.18 PRECAUTIONS CONCERNING THE STARTER

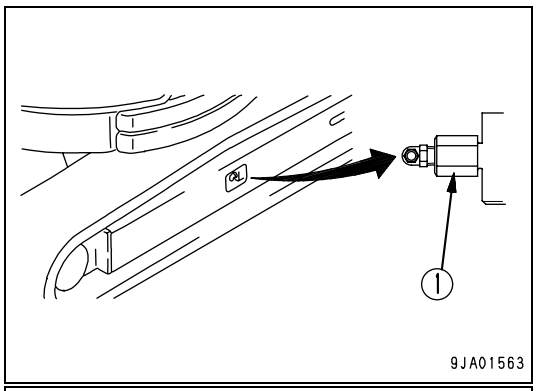
- Start the engine only when correctly seated in the driving position.
- Do not start the engine by tampering with the terminals of the starter, since the machine may move.
- Sudden or accidental movements of the machine may cause serious injury or even death.

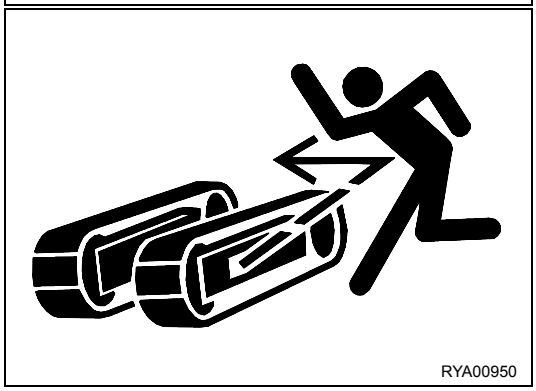




2.4.19 PRECAUTIONS TO BE TAKEN WHEN USING HIGH-PRESSURE GREASE TO ADJUST THE TRACK TENSION

- The grease pumped in the track tension adjustment device is pressurized.
  If the specified maintenance procedure is not carried out correctly during the adjustment, the grease drain valve (1) may come off and cause serious injury or property damage.
- When loosening the grease drain valve (1) to reduce the track tension, do not give more than one turn. Loosen the valve slowly.
- Keep your face, hands, feet and other body parts away from the grease drain valve (1).



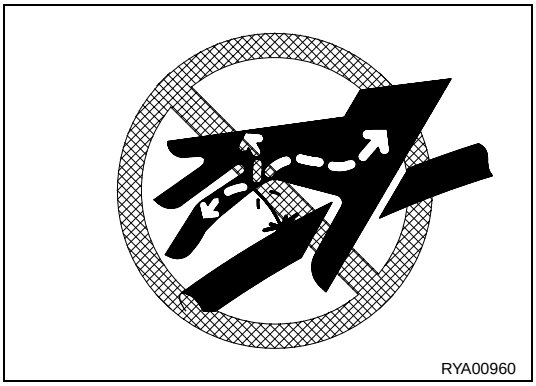


2.4.20 DO NOT REMOVE THE SHOCK ABSORBING SPRING FROM THE SHOCK ABSORBER UNIT

The shock absorber unit is provided with a shock absorbing spring with high preload, in order to absorb the impacts of the front idler roller.
Do not attempt to remove the spring, since this may lead to serious accidents and even death.
For any operation on the shock absorber unit, contact your Komatsu Dealer.

2.4.21 PRECAUTIONS TO BE TAKEN WHEN HANDLING HIGH-PRESSURE OIL

- Do not forget that the work equipment circuits are always under pressure; for this reason, when it is necessary to add or drain hydraulic oil or to perform maintenance operations or inspections on the hydraulic circuit, it is advisable to lower the equipment to the ground and completely release the pressures and the residual pressure present in the tank.
  Small leakages from pipes under pressure and the resulting jets are extremely dangerous, since they can perforate the skin and penetrate in the blood circulation or injure the eyes.
  For this reason, always wear goggles and thick gloves during the inspections and use a piece of cardboard or a sheet of plywood to check for oil leakages.
  If you are hit by a jet of high-pressure oil or are injured, even if slightly, immediately consult a doctor.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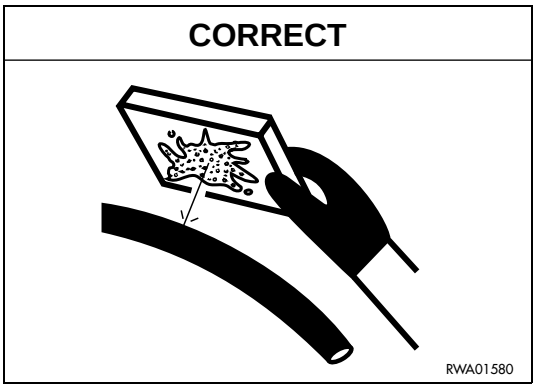

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2.4.22 HANDLING HIGH-PRESSURE HOSES

- If oil or fuel are sprayed out of high-pressure pipes, they may cause fires or malfunctions, and consequently serious injury or property damage. If there are loose bolts, stop working and tighten them at the specified torque. If there are damaged pipes, immediately stop working and contact your Komatsu Dealer.

If any of the following problems arises, change the pipe.

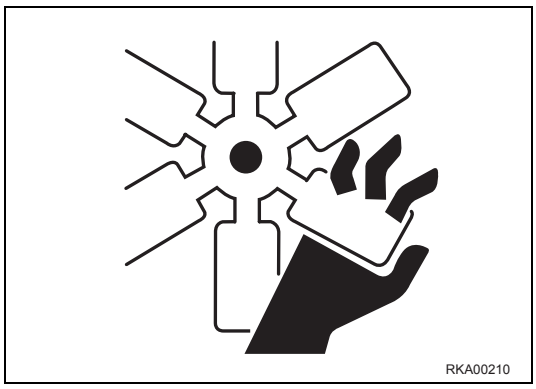
- Damaged or leaking hydraulic seals.
- Worn or cut sheaths or exposed reinforcement layers.
- Sheaths expanded at various points.
- Twisted or crushed moving parts.
- Foreign bodies stuck in the sheaths.

2.4.23 PRECAUTIONS FOR MAINTENANCE OPERATIONS AT HIGH TEMPERATURES AND HIGH PRESSURE

- When the machine is stopped at the end of work, the engine coolant, the oil and all the components are hot and the hydralic circuits are under pressure.
  In these conditions, if the coolant, the hydraulic oil and the engine oil are to be drained in order to change them or the filters, there are serious risks of damage and burns.
  Wait for the temperature to lower within the normal operating range (40–45°C) before carrying out any maintenance operation.

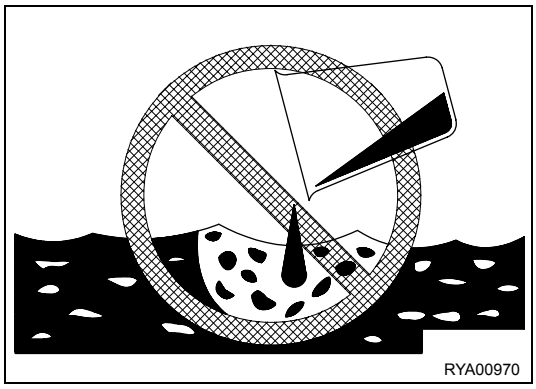
RKA00230

2.4.24 COOLING FAN AND BELT



- Be careful to the revolving parts and do not allow anyone to get too close to them, since clothes or limbs may get caught into them.
- If hands, clothes, or tools become entangled in the fan blades or the fan belt, they may be cut, torn or seriously injured/damaged; for this reason, avoid touching any revolving parts.

2.4.25 WASTE MATERIALS



To avoid pollution, it is important to correctly dispose of waste material.

- Always put used oil in containers. Do not dispose of oil directly onto the ground or into sewage systems, rivers, seas or lakes.
- When disposing of harmful substances such as oil, fuel, coolant, solvents, filters and batteries, keep to the laws and regulations in force.

2.4.26 SERVICING THE AIR CONDITIONER

If the coolant of the air conditioner comes into contact with the eyes, it may cause blindness, while contact with the skin may cause freezing. Avoid touching the coolant.

2.4.27 COMPRESSED AIR

- When cleaning the machine or its parts with compressed air, flying particles may cause serious injury or property damage.
- When using compressed air to clean the machine components or the radiator, always wear safety goggles, mask, gloves, and other protection items.

2.4.28 PERIODICAL CHANGE OF THE PARTS THAT ARE CRITICAL FOR SAFETY

- To ensure that the machine can be used as long as possible in total safety, it is necessary to add oil and carry out the required maintenance operations at regular intervals. To increase safety, safety-related components like pipes and belts must be periodically changed.
  For the replacement of the parts that are critical for safety, see "4.7 PERIODICAL CHANGE OF SAFETY-RELATED COMPONENTS".
- The material used for making these components naturally changes over time and prolonged use may cause deterioration, wear and excessive stress, with the consequent risk of breakages thay may lead to serious injury and property damage. It is difficult to evaluate the conditions of these components through an external check or based on the operator's feelings during work, therefore it is advisable to change them according to the recommended intervals.
- If any defect should be found out, change or repair the components that are critical for safety even before the end of the recommended intervals.

2.4.29 PRECAUTIONS TO BE TAKEN WHEN HANDLING TECHNOPOLYMERS AND ELASTOMERS

⚠ DANGER

- **Some components of the machine contain polymeric and elastomeric materials (Viton sealing rings, Teflon rings, piston rings made of fluoroelastomers, electric cable insulating materials, etc.).**
  At ambient temperature and up to approximately 200°C these materials can be handled without taking special precautions, since they are completely inert.
  If these materials are burnt, they send out gas and become highly toxic.
  Once they have cooled down, these materials must be collected in tight bags using heavy, waterproof gloves; then, gloves and materials must be disposed of according to the current regulations in force.
  The contaminated parts of the machine must be washed with highly alkaline detergents and then with a solution of water and detergent.

- Avoid burning gaskets, eletric cables, sealing rings.
- Dispose of elastomeric and polymeric waste according to the regulations in force.
- Do not touch any burnt elastomeric or polymeric waste and in case of accidental burning avoid inhaling the toxic gases produced.
- In case of contact with the skin, immediately rinse with a solution made of water and an alkaline detergent for about 30 minutes and then contact a poisoning treatment center without delay.

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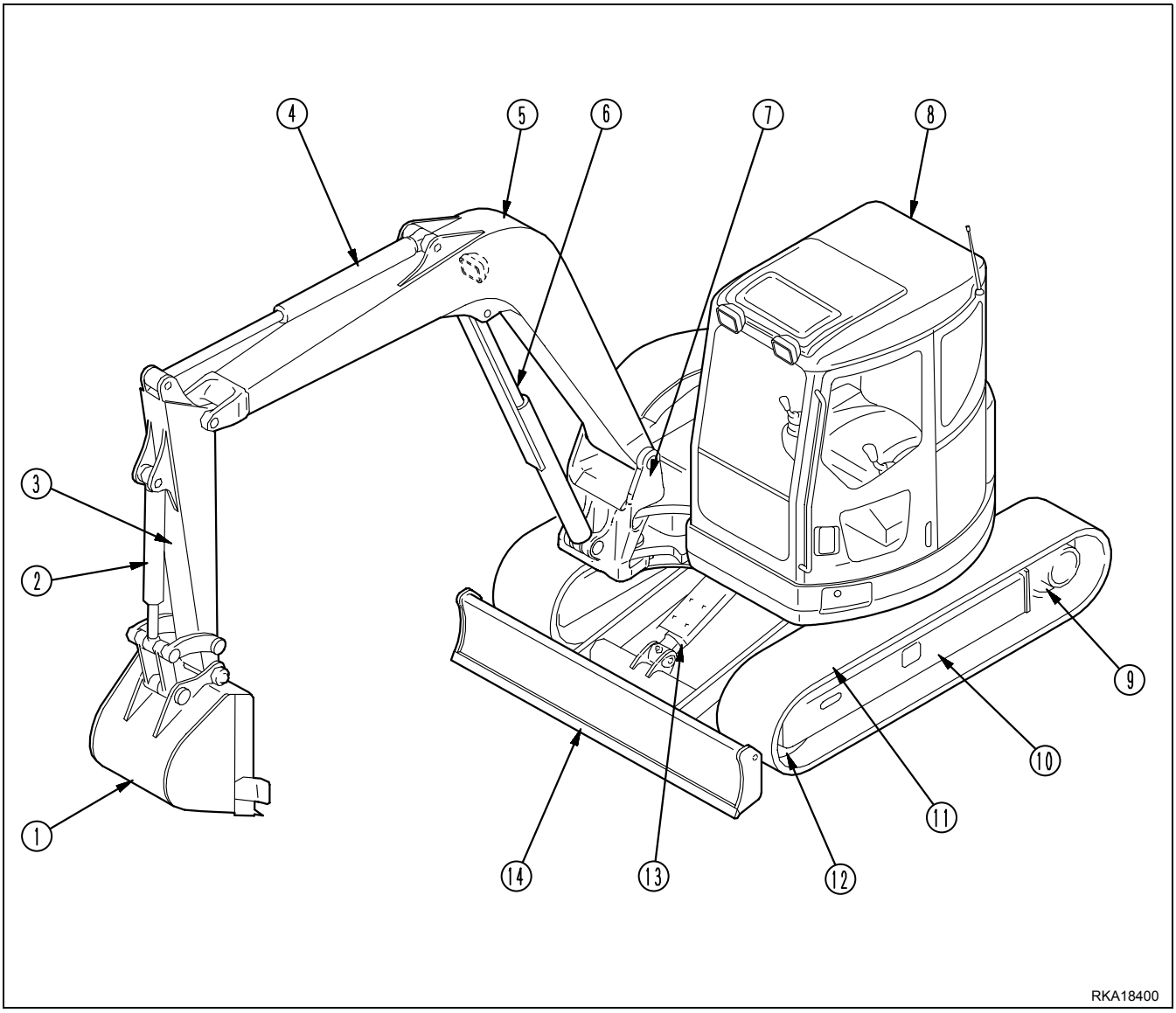
2.4.30 PRECAUTIONS TO BE TAKEN WHEN USING SYNTHETIC BIODEGRADABLE OIL TYPE HEES

- It is not possible to mix the synthetic biodegradable oil type HEES with ordinary hydraulic oils, since when the temperature increases insoluble compounds are generated, which deposit on the filters and clog them (the maximum concentration of ordinary oil must not exceed 1% of the total quantity of oil).
- Biodegradable oil can be used only in the hydraulic system; it cannot be used for the engine, the transmissions, the braking system, etc.
- Before introducing biodegradable oil in the hydraulic system, drain the system completely, disconnecting the cylinders and all the parts that may contain traditional oil, then change the drain filter with a new one.
  Start the engine and let it idle before using the equipment, wait for the engine temperature to reach at least 40°C, then start moving the equipment to fill all the circuits with oil. Stop the engine and check the oil level (see "3.3.2.4 CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP").

THE MACHINE AND ITS OPERATIONS

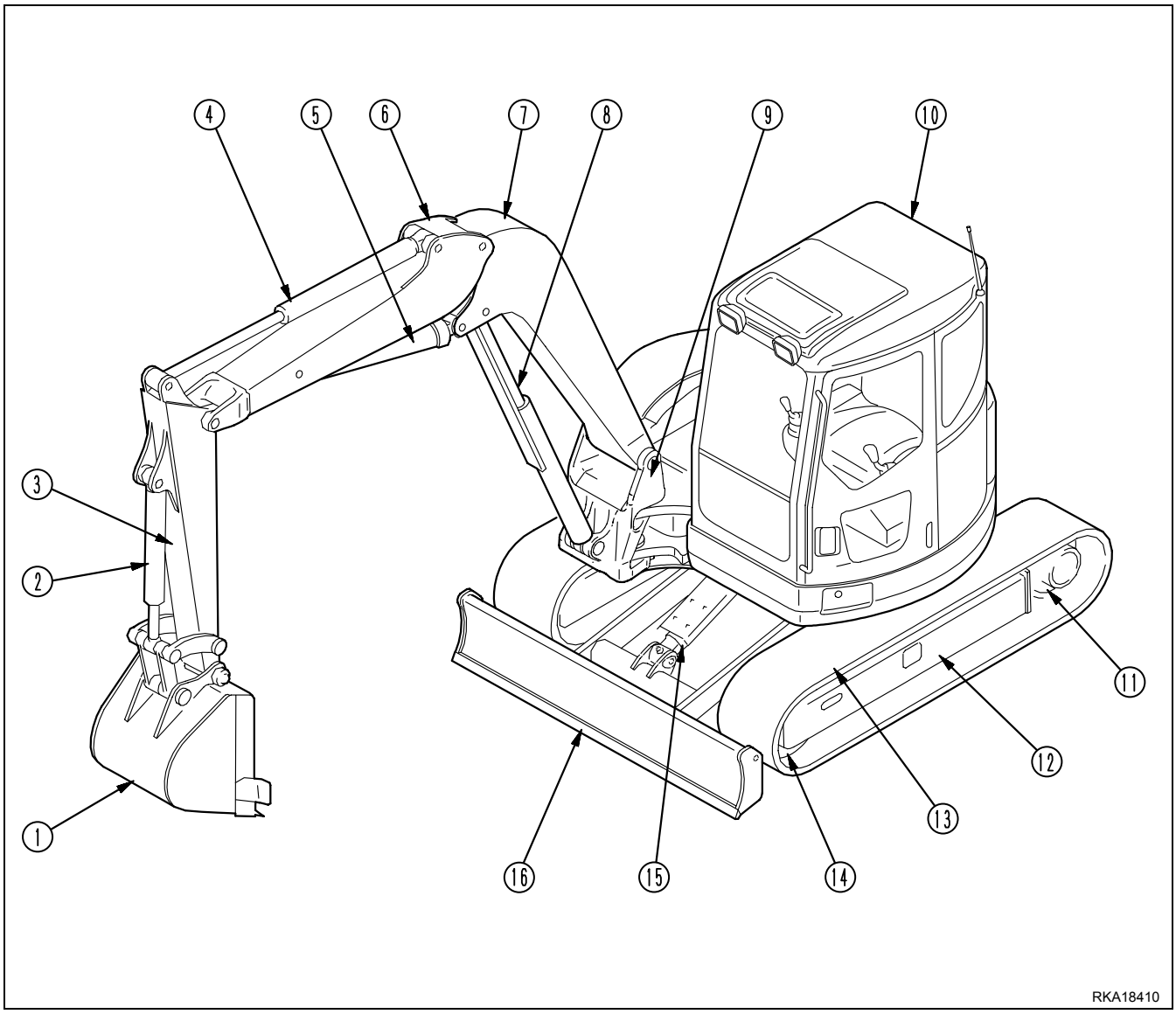
3.1 DESCRIPTION AND USE OF THE MACHINE

3.1.1 GENERAL VIEW OF THE MACHINE WITH MONOBOOM



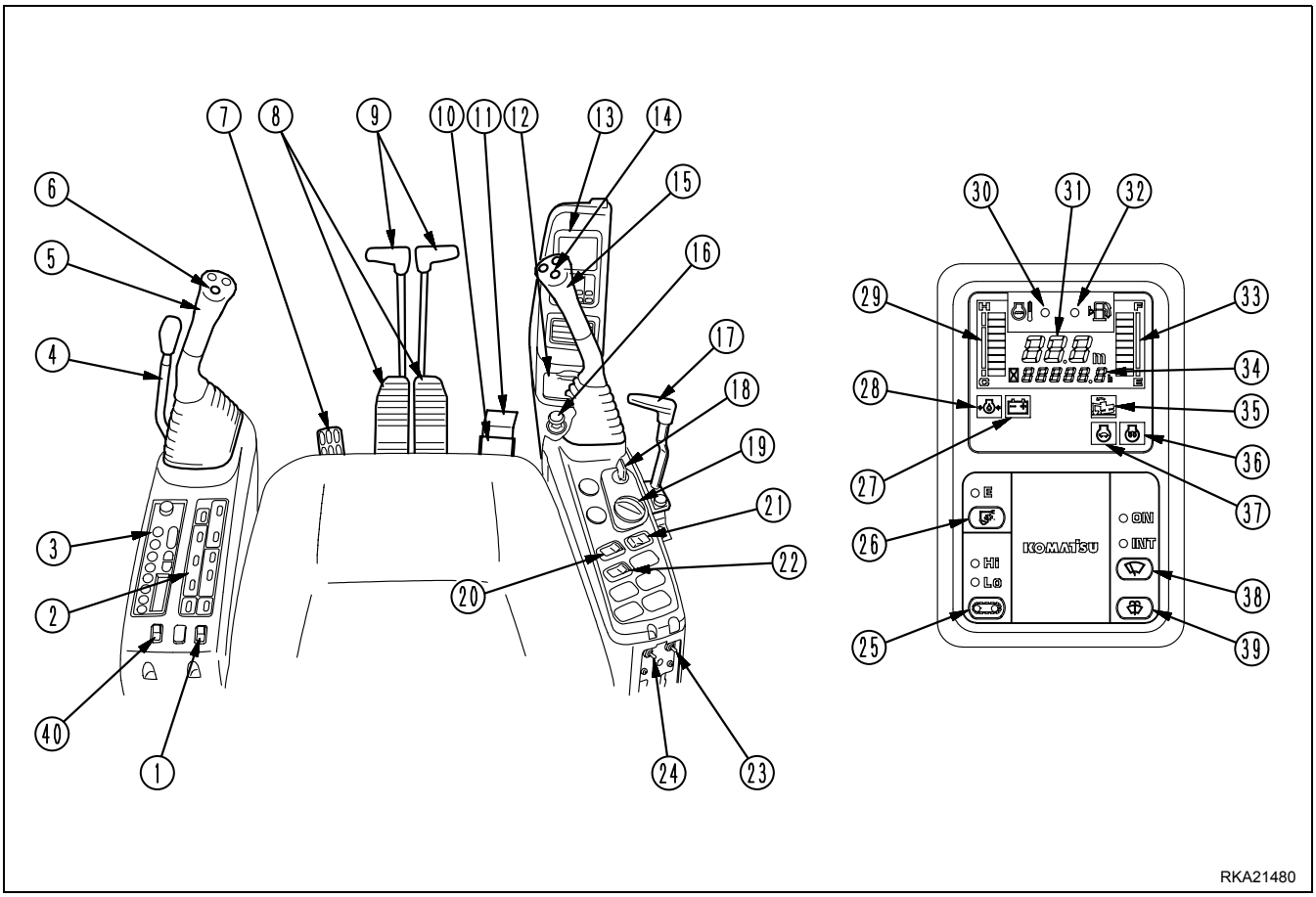
(1) Bucket
(2) Bucket cylinder
(3) Arm
(4) Arm cylinder
(5) Monoboom
(6) Lifting cylinder
(7) Revolving support
(8) Cab
(9) Sprocket
(10) Undercarriage
(11) Track
(12) Idler roller
(13) Cylinder blade
(14) Blade

3.1.2 GENERAL VIEW OF THE MACHINE WITH TWO-PIECE BOOM



(1) Bucket
(2) Bucket cylinder
(3) Arm
(4) Arm cylinder
(5) Two-piece boom cylinder
(6) Two-piece boom 2nd section
(7) Two-piece boom 1st section
(8) Lifting cylinder
(9) Revolving support
(10) Cab
(11) Sprocket
(12) Undercarriage
(13) Track
(14) Idler roller
(15) Blade cylinder
(16) Blade

3.1.3 CONTROLS AND INDICATORS



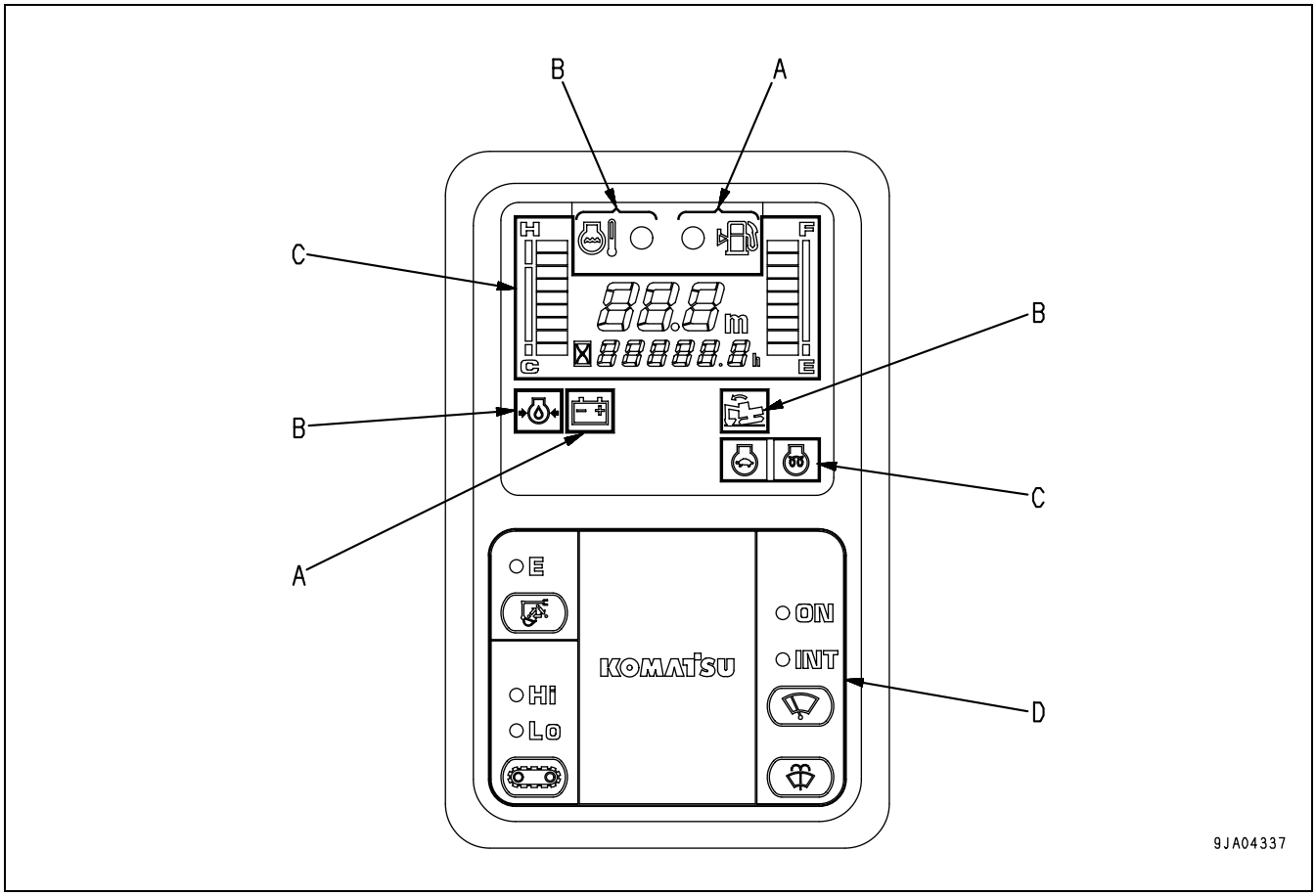
(1) Overload alarm switch
(2) Heating or air conditioning control panel
(3) Car radio (if installed)
(4) Control locking lever (safety lever)
(5) Left work equipment control lever
(6) Quick deceleration switch
(7) Two-piece boom control pedal
(8) Travel pedals
(9) Travel levers
(10) Boom swing control pedal
(11) Pedal lock
(12) Ashtray
(13) Machine monitor
(14) Horn button
(15) Right work equipment control lever
(16) Cigarette lighter (24V)
(17) Blade control lever
(18) Ignition switch
(19) Hand accelerator
(20) Work light switch
(21) Acoustic alarm stop switch
(22) Revolving light switch (optional)
(23) Pump system deactivation emergency switch
(24) Boom and turret swing brake deactivation emergency switch
(25) Travel speed selection switch
(26) Work mode selection switch
(27) Battery charge level warning light
(28) Engine oil pressure warning light
(29) Engine coolant temperature indicator
(30) Engine coolant temperature warning light
(31) Display (for displaying failures)
(32) Fuel level warning light
(33) Fuel gauge
(34) Hour meter
(35) Overload alarm warning light
(36) Preheating warning light
(37) Quick deceleration warning light
(38) Windshield wiper switch
(39) Windshield washer switch
(40) Quick hydraulic coupling lock/release button

3.2 INSTRUMENTS AND CONTROLS

The following paragraphs describe the devices that are necessary for correct operation of the machine.

To perform the required operations correctly and safely, it is important to understand the equipment operating methods and the meaning of the information displayed.

3.2.1 DASHBOARD



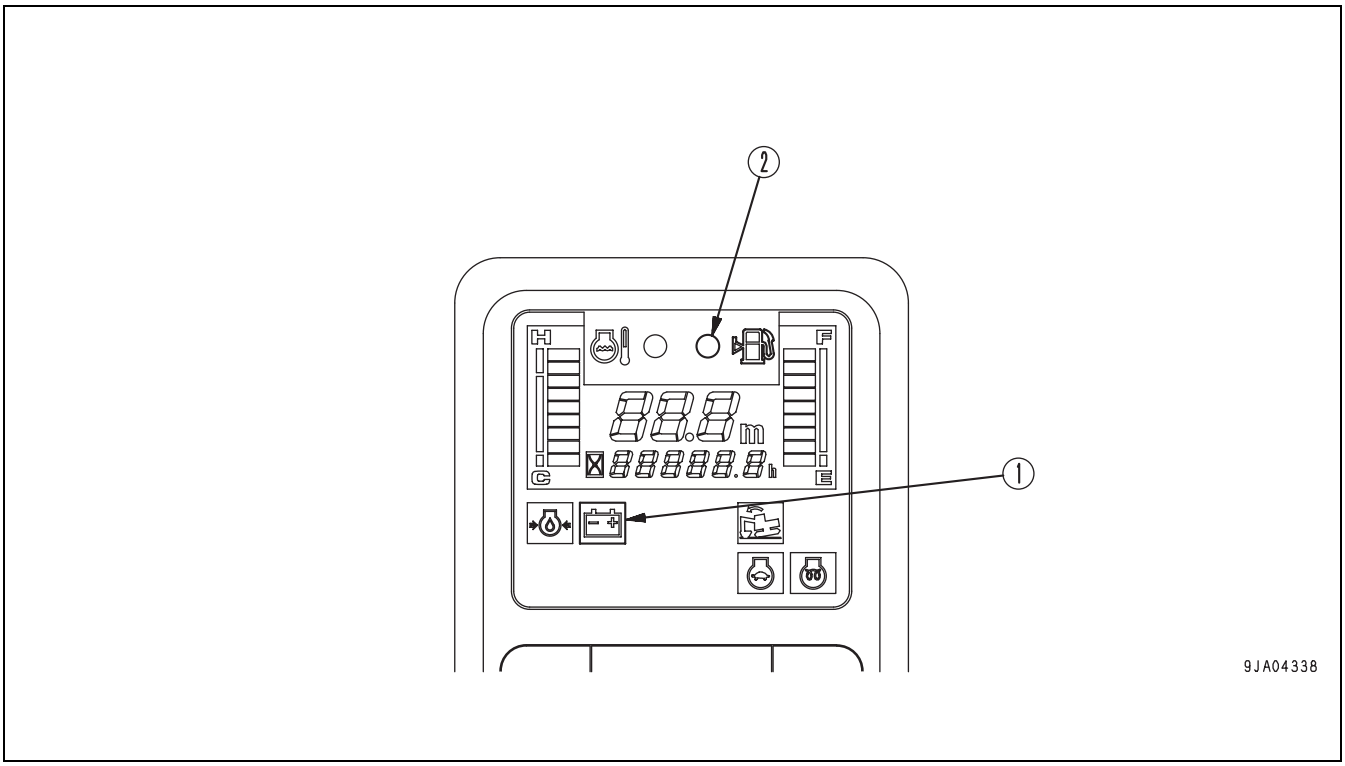
(A): Warning lights
(B) Emergency lights
(C) Warning lights and indicators display
(D) Switches display

3.2.1.1 WARNING LIGHTS

⚠ CAUTION

- **If a warning light blinks or comes on while the engine is running, check the problem and carry out the necessary maintenance operations.**
  Do not neglect any problem signalled by the warning lights, in order to avoid machine failures.

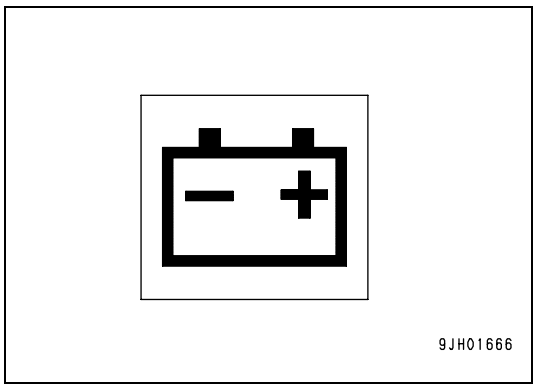
These warning lights must always be checked while the engine is running. In case of anomaly, the necessary repair is indicated immediately.
In case of anomaly, the corresponding warning light starts blinking and the acoustic alarm sounds.



(1) Battery charge level warning light

(2) Fuel level warning light

1. BATTERY CHARGE LEVEL WARNING LIGHT

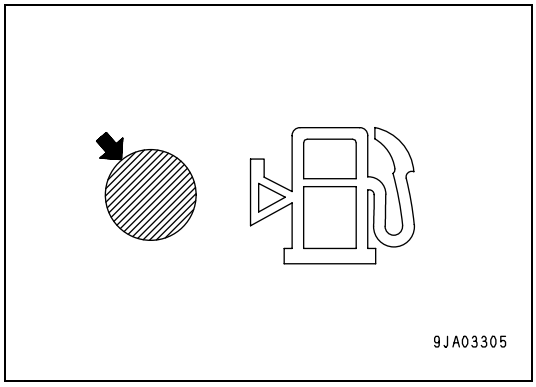


This warning light (1) signals any anomaly in the charging system during the operation of the engine.
If the warning light blinks, check the V-belt tension. In case of anomaly, refer to paragraph"3.7.10 OTHER TROUBLES".
If the warning light blinks, stop the engine or let it idle, then check the problem and carry out the necessary repair.

NOTE

- This warning light comes on when the ignition switch is turned to position ON with the engine off, but this does not indicate any anomaly.
- When the engine is started or stopped with the ignition switch in position ON, the warning light may come on and the acoustic alarm may sound for a while, but this does not indicate any anomaly.

2. FUEL LEVEL WARNING LIGHT



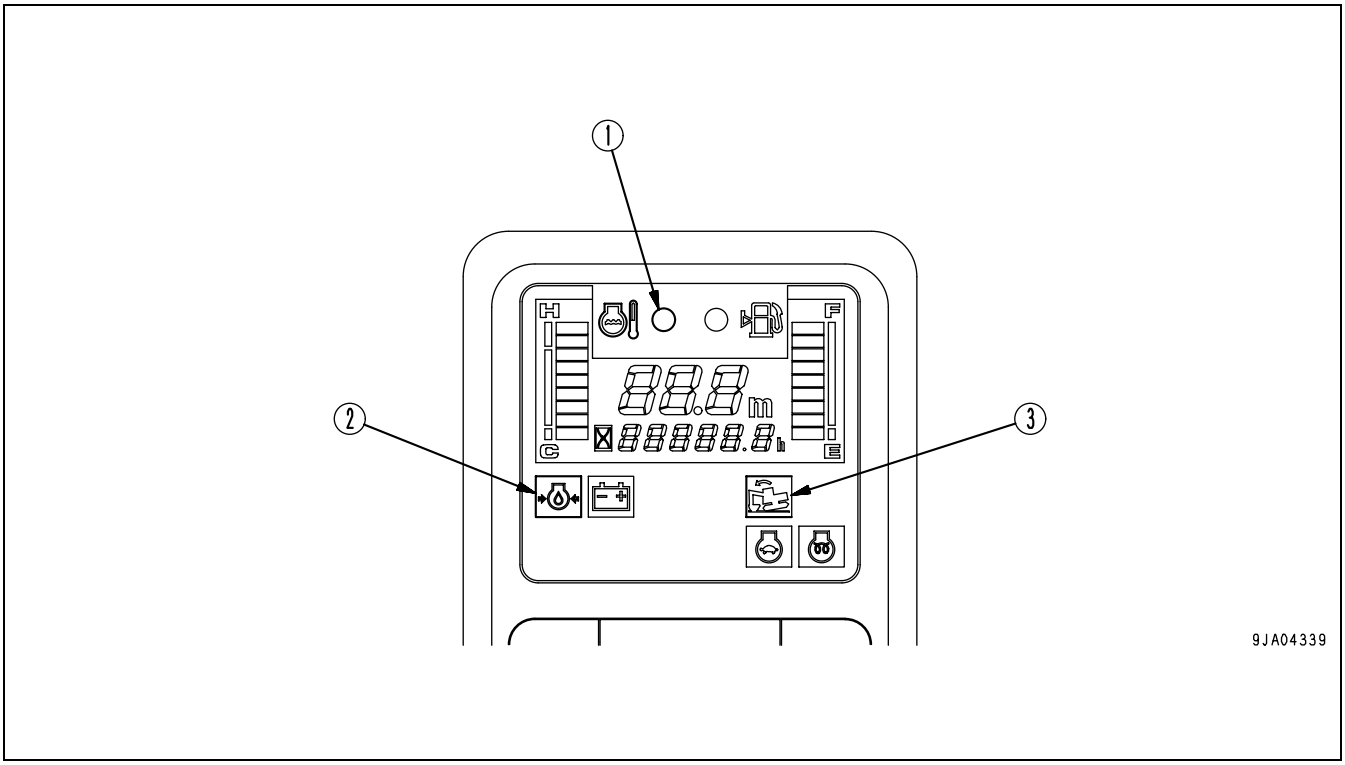
This warning light (2) indicates that the fuel level in the tank has decreased.
The fuel level warning light starts blinking when there are still approx. 30 litres of fuel in the tank. At this point it is necessary to refuel as soon as possible.

3.2.1.2 EMERGENCY WARNING LIGHTS

⚠ CAUTION

- **If a warning light does not go out or comes on when the engine is running, stop the machine immediately and try to find the cause of the failure.**

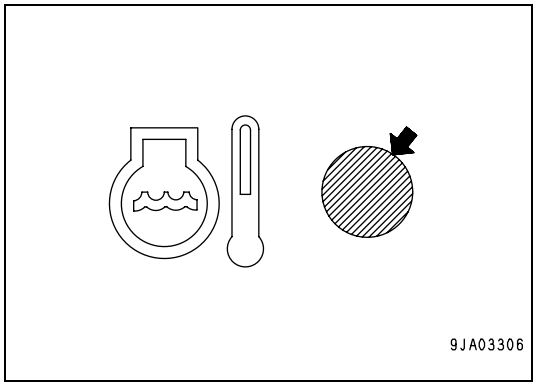
These warning lights must always be checked while the engine is running. In case of anomaly, the corresponding warning light starts blinking and the acoustic alarm sounds. Carry out the necessary repairs immediately.



(1) Engine coolant temperature warning light
(2) Engine oil pressure warning light
(3) Overload alarm warning light

1. ENGINE COOLANT TEMPERATURE WARNING LIGHT

This warning light (1) signals any abnormal increase in the engine coolant temperature.
When the temperature increases abnormally, the warning light starts blinking.
In this case, stop working and let the engine idle until the engine coolant temperature indicator returns to the green area.

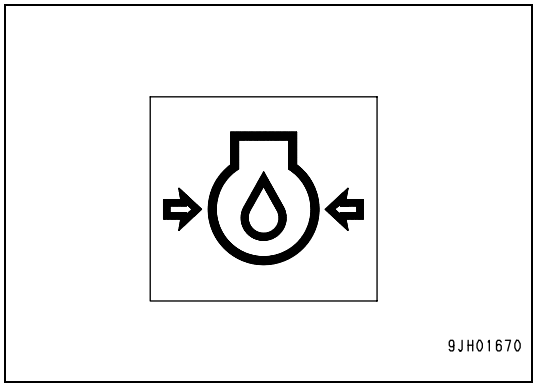


2. ENGINE OLI PRESSURE WARNING LIGHT

This warning light (2) signals that the engine oil pressure is below the set values. If it starts blinking, stop the engine and check the oil level in the oil pan and in the lubrication system.

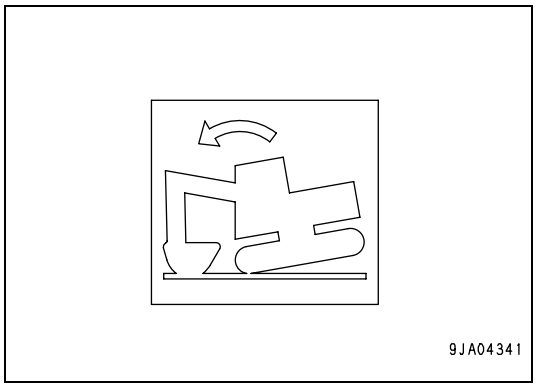
NOTE

- This warning light comes on when the ignition switch is turned to position ON with the engine off, but this does not indicate any anomaly.
- When the engine is started or stopped with the ignition switch in position ON, the warning light may come on and the acoustic alarm may sound for a while, but this does not indicate any anomaly.

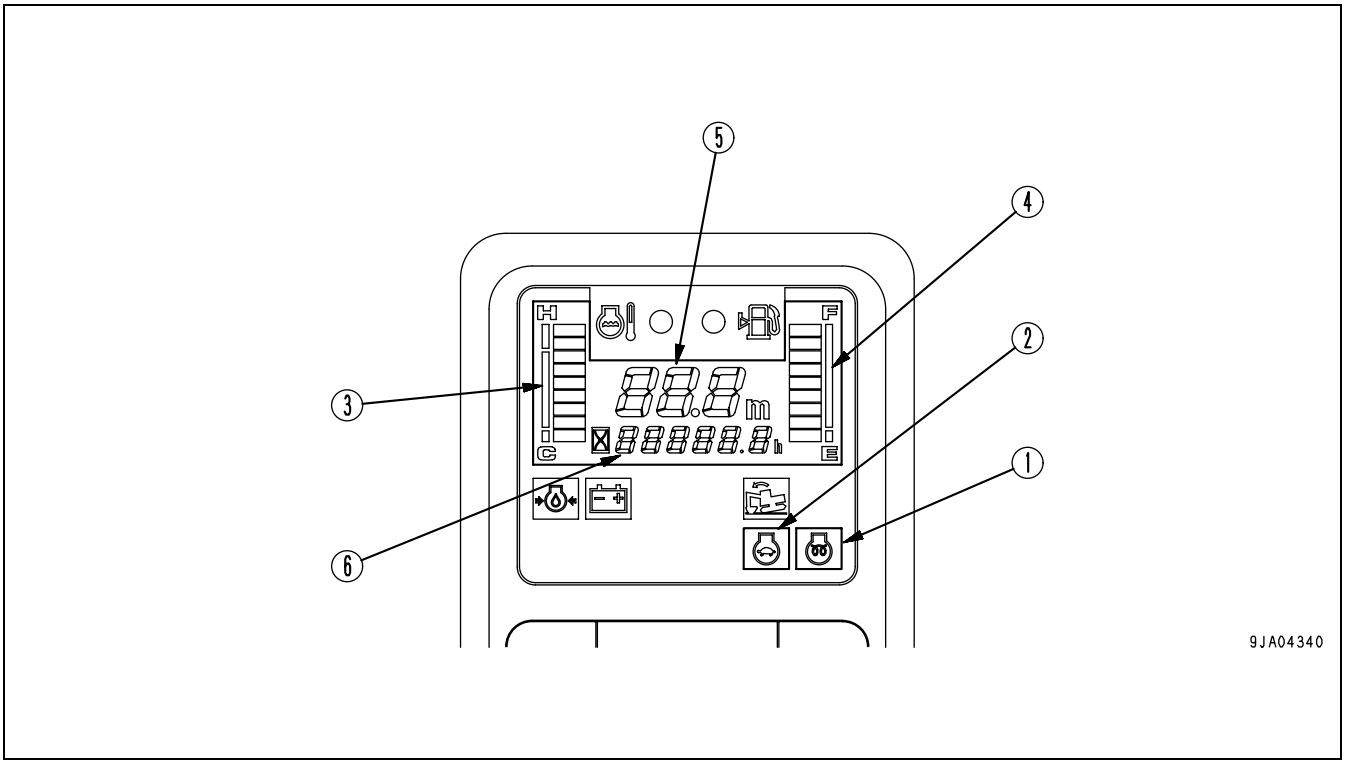


3. OVERLOAD ALARM WARNING LIGHT (WHEN THE ALARM IS CONNECTED)

This warning light (3) blinks when an excessively heavy object is lifted. If it starts blinking, stop working and reduce the load.



3.2.1.3 WARNING LIGHTS AND INDICATORS DISPLAY



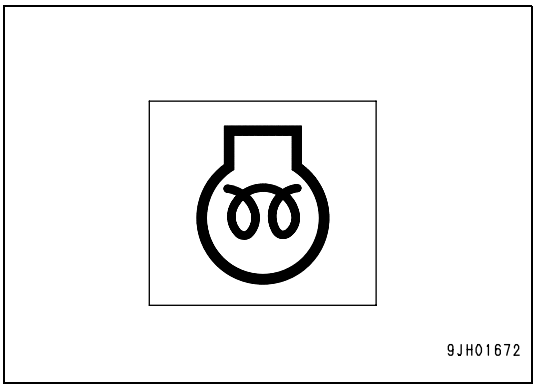
(1) Engine preheating warning light
(2) Quick deceleration warning light
(3) Engine coolant temperature indicator
(4) Fuel gauge
(5) Display
(6) Hour meter

WARNING LIGHTS

When the ignition switch is in position ON, the warning lights display comes on to confirm that the corresponding devices function correctly.

1. ENGINE PREHEATING WARNING LIGHT

This warning light (1) indicates the preheating time that is necessary when the engine is started at a temperature below 0°C (32° F).
The warning light comes on when the ignition switch is turned to position HEAT and starts blinking after approximately 30 seconds to confirm that the preheating stage has been completed. (The warning light goes out after approximately 10 seconds).



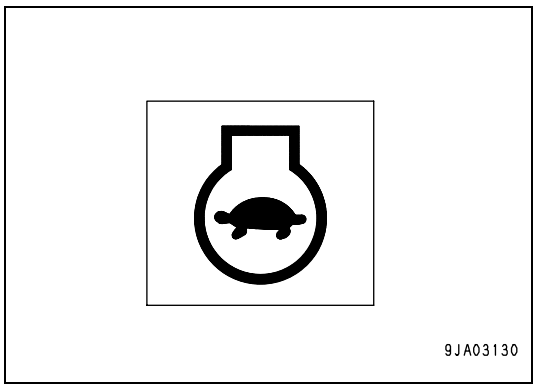
2. Quick deceleration warning light

This warning light (2) informs the operator that the quick deceleration function has been activated.

Function activated: warning light on.

Function deactivated: warning light off

When the quick deceleration switch is pressed, the corresponding warning light comes on. When the switch is pressed again, the light goes out.

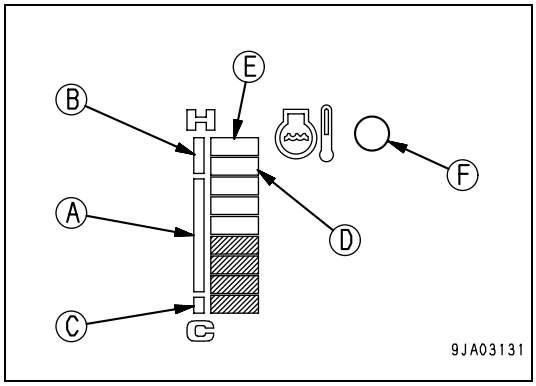


NOTE
- When the quick deceleration warning light comes on, the engine rpm remain at the minimum value even if the hand accelerator is operated.

INDICATORS AND METERS

3. ENGINE COOLANT TEMPERATURE INDICATOR

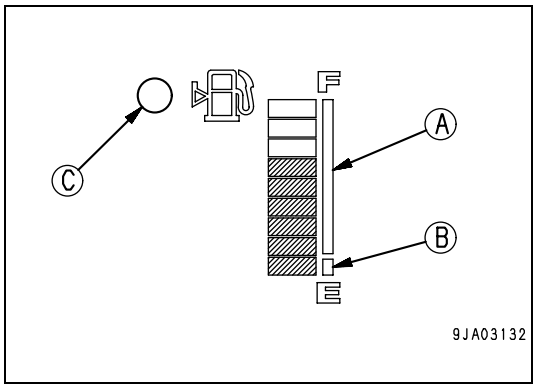
This indicator (3) shows the engine coolant temperature. When the engine is running normally, the green area (A) of the indicator should be lit.
If the red area (B) of the indicator lights up during operation, let the engine idle and wait for the temperature to decrease until the green area (A) lights up again. After starting the engine, keep warming it up until the coolant temperature increases and the green area of the indicator lights up instead of the white area (C).



NOTE
- When segment D lights up, also the engine coolant temperature warning light (F) starts blinking.
- When segment E lights up, also the engine coolant temperature warning light (F) starts blinking. The acoustic alarm sounds at the same time.

4. FUEL GAUGE

This indicator (4) shows the fuel level in the tank. When the engine is running normally, the green area (A) of the indicator should be lit. If the red area (B) starts blinking while the engine is running, this means that there are still 30 litres of fuel in the tank, therefore it is necessary to check and refuel. The correct level may not be indicated for a short lapse of time soon after the ignition switch has been turned to position ON, but this does not mean that there is an anomaly.

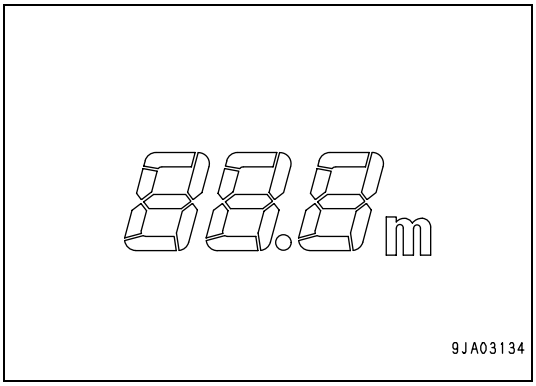


NOTE
- When the red area (B) of the fuel gauge lights up, also the fuel level warning light (C) starts blinking.

5. DISPLAY

This display (5) gives failure signals if any anomaly is detected on the machine.

NOTE
- In case of machine failure, an error signal is displayed while the ignition switch is in position ON. The display blinks and all error messages are displayed in sequence.



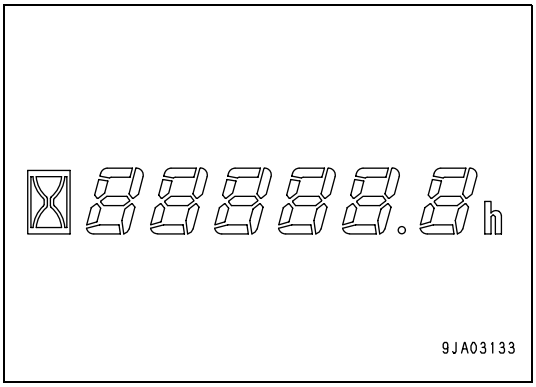
If the right part of the display blinks, see "3.7.10.4 ELECTRONIC CONTROL SYSTEM".

Information displayed	Error type
E02	Pump control system error
E03	Swing brake system error
E05	Speed governor system error

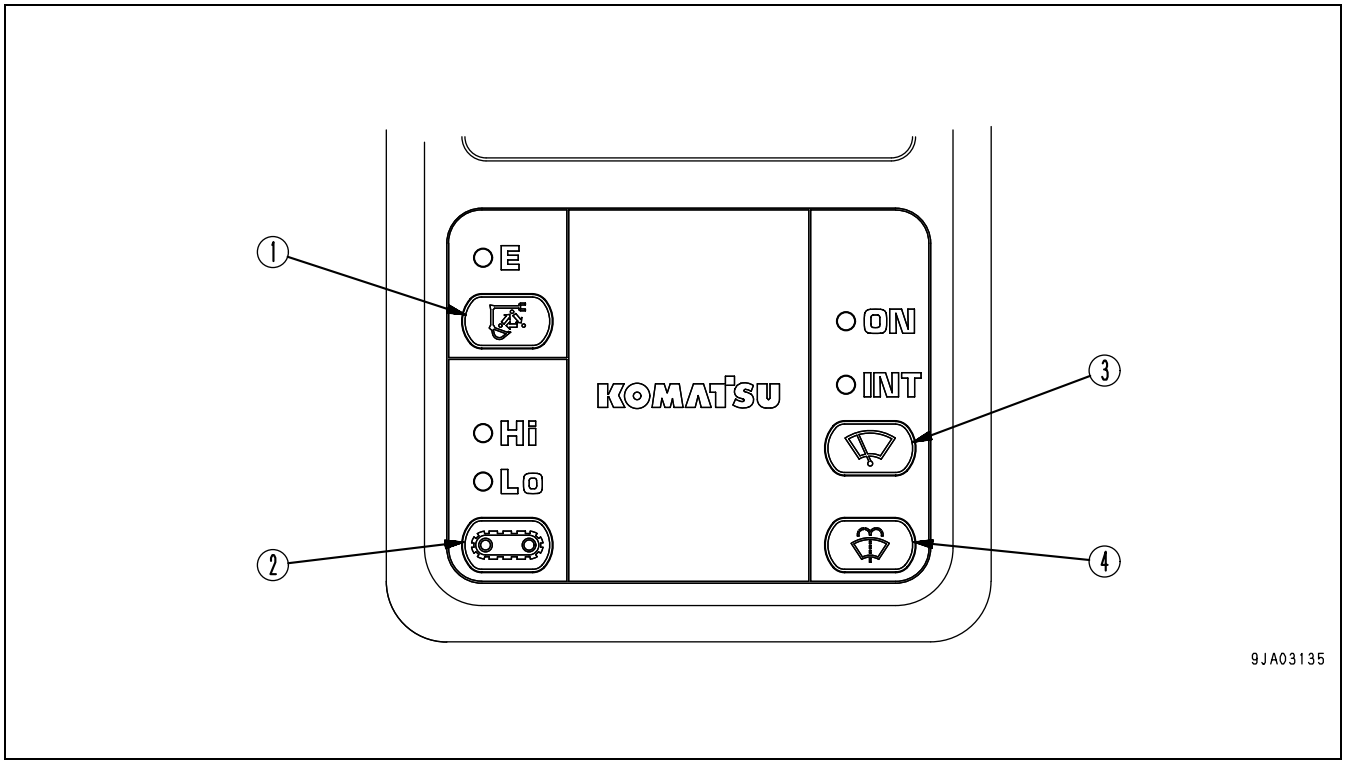
6. HOUR METER

The hour meter (6) indicates the total number of operating hours of the machine.
Use the hour meter as reference for the routine maintenance intervals.
The hour meter is active when the engine is in operation, independently of whether the machine is moving or not.

NOTE
- The number of hours is increased by 1 every hour of operation, independently of the engine speed.



3.2.1.4 SWITCHES DISPLAY



(1) Work mode selection switch
(2) Travel speed selection switch
(3) Windshield wiper switch
(4) Windshield washer switch

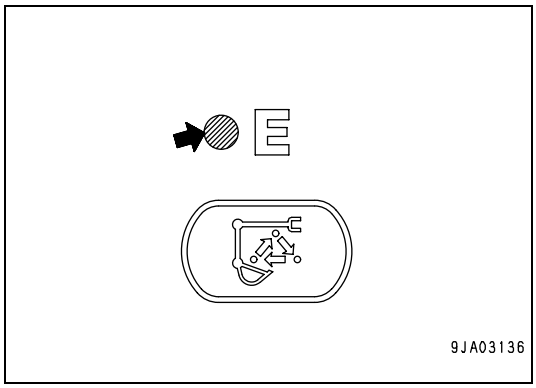
1. Work mode selection switch

This switch (1) is used to select the power and movements of the work equipment.
Any work can be carried out more easily by selecting the work mode suitable for the operation at hand.

E off: Active mode (for heavy-duty applications)

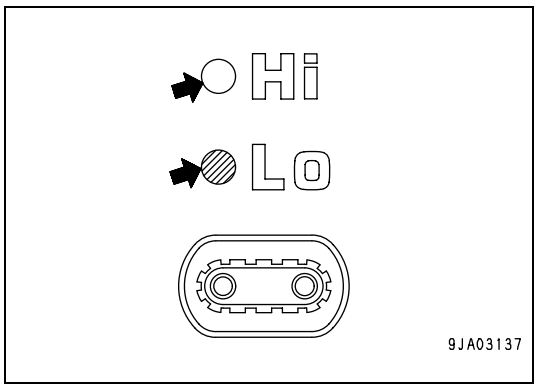
E on: Economy mode (when fuel saving is desired)

The work mode changes every time the switch is pressed.



NOTE
- When the engine is started, the Active mode (for heavy-duty applications) is automatically selected.

2. Travel speed selection switch



⚠ WARNING

- **When loading or unloading the machine on/from a trailer, always select the low speed. Never operate the travel speed selection switch during the loading or unloading operation.**
- **Changing over from high to low speed during travel may cause the machine to deviate laterally even if it is moving on a straight line.**
- **Stop the machine before using the travel speed selection switch.**

This switch (2) is used to select the high or slow travel speed.

Position Lo: low travel speed

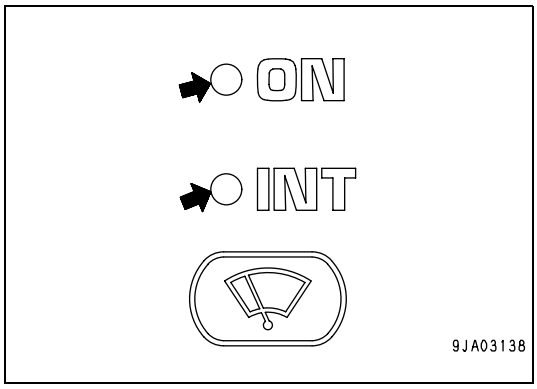
Position Hi: high travel speed

The travel speed changes every time the switch is pressed.

NOTE

- When the engine is started, the low speed is automatically selected.
- When the machine travels at high speed (Hi), if more power is required in case of soft ground or on slopes, the low speed (Lo) is automatically selected, therefore there is no need to use the switch. The high speed (Hi) warning light remains on.

3. Windshield wiper switch



Use the switch (3) to operated the front windshield wiper.

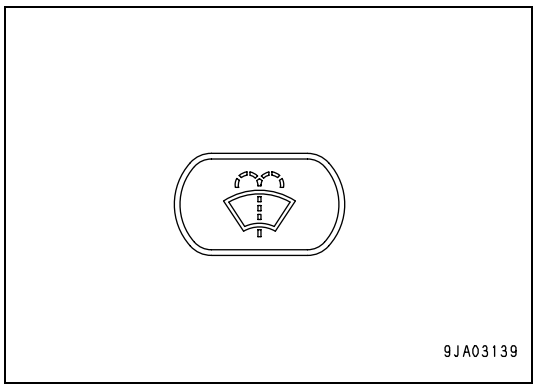
ON: the windshield wiper works continuously.

INT: the windshield wiper works intermittently.

OFF: the windshield wiper is off.

The windshield wiper operating mode changes in the following order: off →intermittent →continuous →off, every time the switch is pressed.

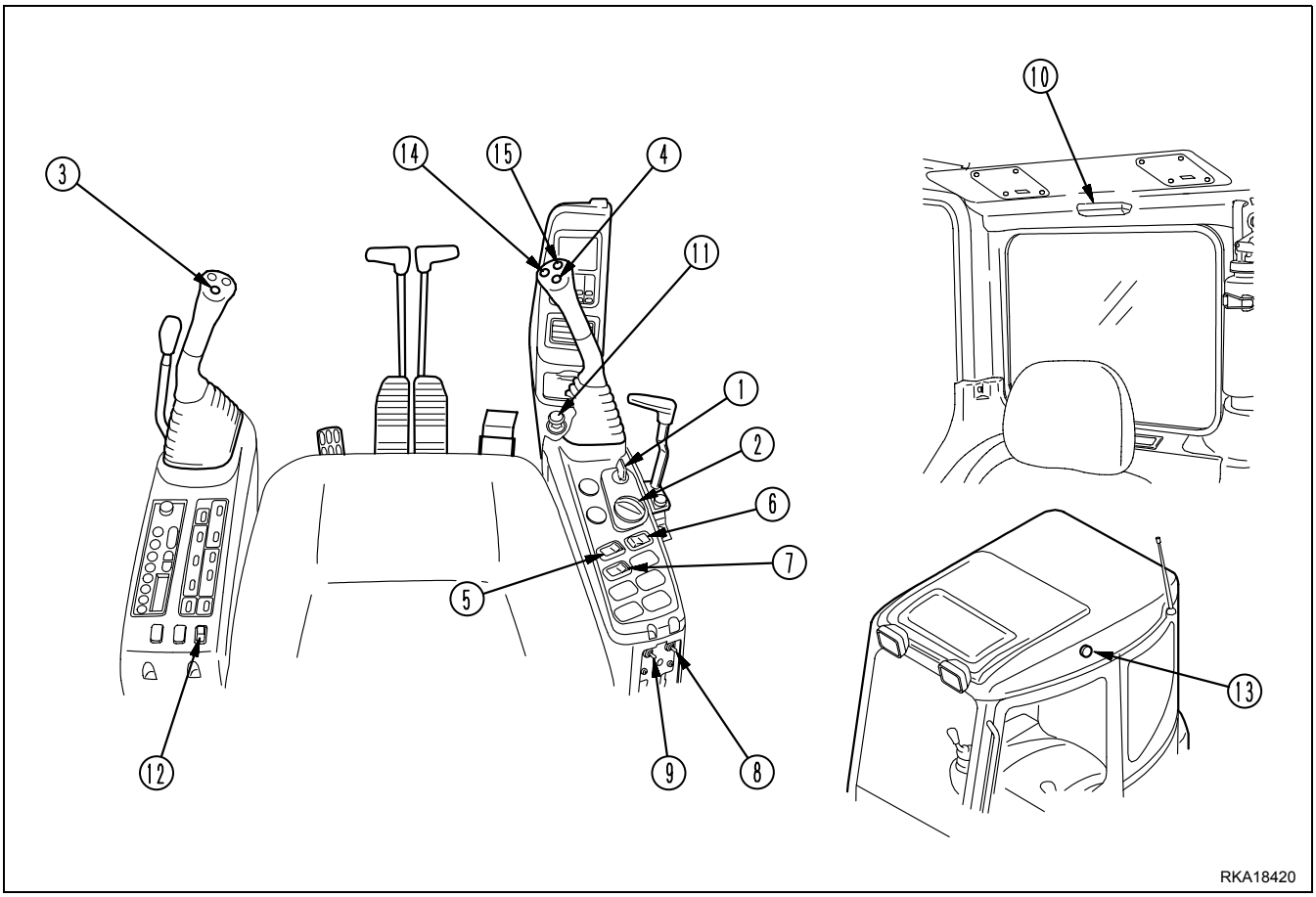
4. Windshield washer switch



This switch (4) must be kept pressed to spray the detergent on the front windshield. When the switch is released, spraying is interrupted.

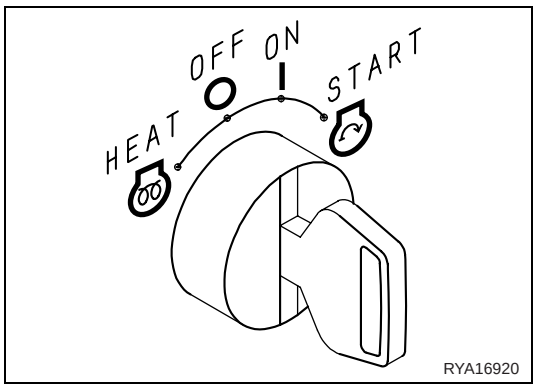
- If the switch (4) is kept pressed with the windshield wiper off, the detergent is sprayed on the glass and at the same time the wiper is operated continuously. When the switch (4) is released, the windshield wiper keeps functioning continuously for two cycles, then stops.
- If the windshield wiper is operated intermittently and the switch (4) is kept pressed, the detergent is sprayed on the glass and at the same time the wiper is operated continuously. When the switch (4) is released, the windshield wiper keeps functioning continuously for two cycles, then returns to the intermittent mode.

3.2.2 SWITCHES AND PUSH BUTTONS



(1) Ignition switch
(2) Hand accelerator
(3) Quick deceleration switch
(4) Horn button
(5) Work light switch
(6) Acoustic alarm stop switch
(7) Revolving light switch (optional)
(8) Pump system deactivation emergency switch
((9) Boom and turret swing brake deactivation emergency switch
(10) Overhead light
(11) Cigarette lighter (24V)
(12) Overload alarm switch
(13) Power outlet (24V)
(14) Clamshell bucket opening button
(15) Clamshell bucket clamping or demolition hammer control button

1. Ignition switch



RYA16920

This is a four-position rotary switch and is used to switch the engine on and off.

Position OFF

The key can be inserted or removed. The switches of the electric system are all off, except for the overhead light and hour meter switches, and the engine is off.

Position ON

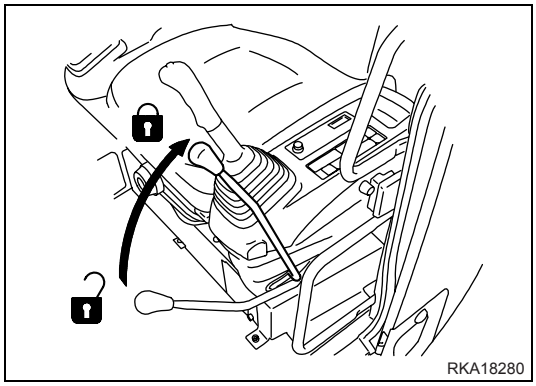
Electric current flows in the recharge circuit and in the lighting circuit. Keep the ignition switch in position ON while the engine is running.

Position START

This is the engine start position. Keep the key in this position while starting the engine. As soon as the engine starts, release the key, which will automatically return to position ON.

Position HEAT (preheating)

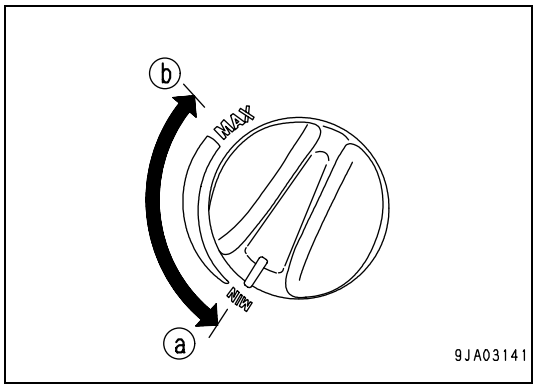
When starting the engine in cold climates, turn the key to this position. When the key is in position HEAT, the preheating warning light comes on. Keep the key in this position until the preheating warning light starts blinking. As soon as the warning light starts blinking, release the key. Release the key, which will automatically return to position OFF. At this point, start the engine by turning the key to position START.


RKA18280

NOTE

- The engine cannot be started if the safety lever isn't in position "lock".

2. Hand accelerator



9JA03141

The hand accelerator (2) is used to control the engine speed and output.

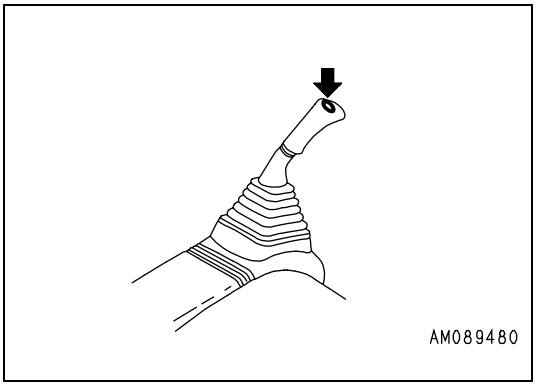
(a) Idling: the knob is rotated completely to the left (anticlockwise).

(b) Maximum: the knob is rotated completely to the right (clockwise).

NOTE

- When the quick deceleration warning light comes on, the engine rpm remain at the minimum value even if the hand accelerator is operated. To increase the engine speed, press the quick deceleration switch on the left work equipment control lever and deactivate the deceleration function.

3. Quick deceleration switch



⚠ WARNING

- **Before using the quick deceleration switch, always shift the work equipment and travel levers to neutral. If the switch is pressed with one or more of these levers shifted, the engine torque changes suddenly.**

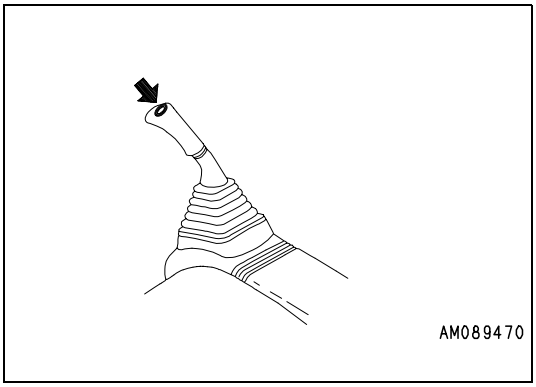
This switch (3) is used to reduce the engine speed and fuel consumption when no power is required of the engine, for example when the travel levers, the travel pedals and the work equipment control levers are in neutral.
When the quick deceleration switch positioned at the centre of the grip of the left work equipment control lever is pressed, the corresponding warning light comes on and the engine rpm decrease until reaching the idling speed.
When the quick deceleration switch is pressed again, the corresponding warning light goes out and the engine speed returns to the rpm selected with the hand accelerator.

NOTE

- When the hand accelerator is set on idling speed, this cannot be further reduced, not even by pressing the quick deceleration switch.
- If the engine speed cannot be increased, this may be due to the fact that the switch is pressed. Check the quick deceleration warning light to verify the condition of the switch.
- If the ignition switch is turned to position OFF when the quick deceleration switch is in position ON, the deceleration function is deactivated.

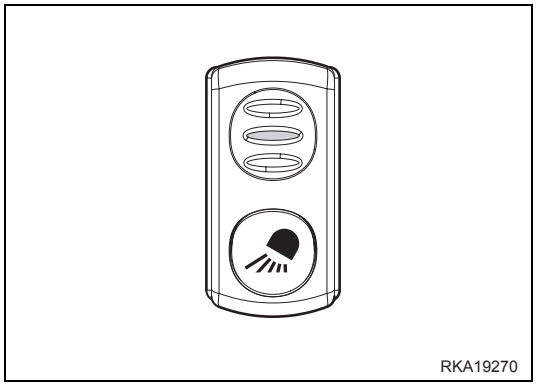
4. Horn push button

This button is positioned at the centre of the right lever knob and serves to send out a warning signal at the beginning of work and in case of danger.



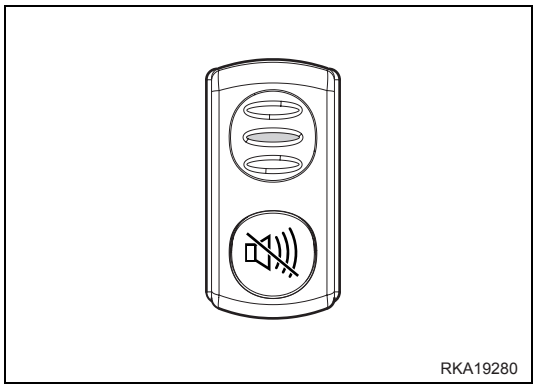
5. Work light switch

This switch (5) turns on the work light (including an additional one) and the corresponding warning light.


RKA19270

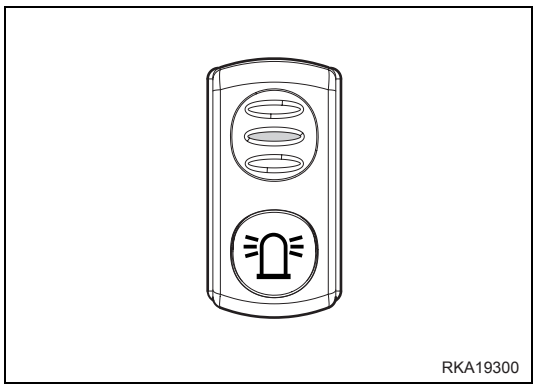
6. Acoustic alarm stop switch

This switch (6) is used (with the engine running) to stop the acoustic alarm when this sounds to alert the operator in case of failure.

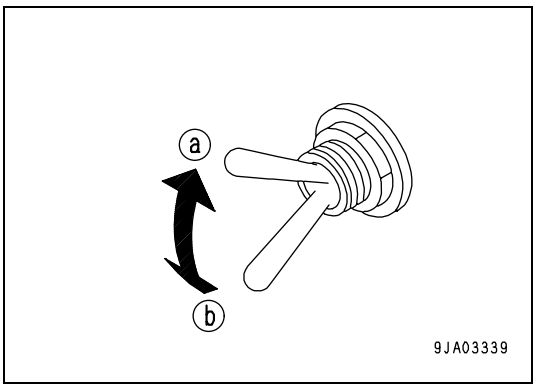

RKA19280

7. Revolving light switch (optional)

This switch (7) is used to start the revolving light.


RKA19300

8. Pump system deactivation emergency switch



IMPORTANT

- **This switch allows the machine to work temporarily in case of failure in the pump control system. It must not be used permanently. The failure that caused the anomaly must be repaired immediately.**
- **If this switch is inadvertently pressed and set to position EMERGENCY while the machine is in normal operating conditions, the code “E02” appears on the display.**
- **If the code “E02” is displayed during work, make sure that the switch is in the correct position.**

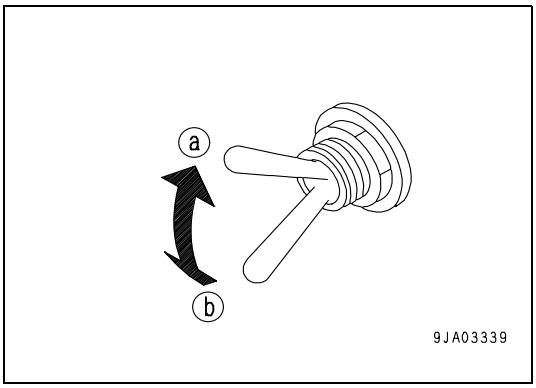
This switch (8) is used to allow the machine to work temporarily in case of failure in the pump control system (when "E02" appears on the display).

(a) EMERGENCY abnormal situation (shift the lever switch upward)

(b) NORMAL: normal situation (shift the lever switch downward)

If the code “E02” appears on the display, shift the lever switch upward to be able to go on working.

9. Boom and turret swing brake deactivation emergency switch



IMPORTANT

- **This switch allows the machine to work temporarily in case of failure in the turret swing or boom swing braking systems. It must not be used permanently. The failure that caused the anomaly must be repaired immediately.**
- **If this switch is inadvertently pressed and set to position EMERGENCY while the machine is in normal operating conditions, the codes “E03” or “E41” appear on the display.**
- **If the codes “E03” or “E41” are displayed during work, make sure that the switch is in the correct position.**

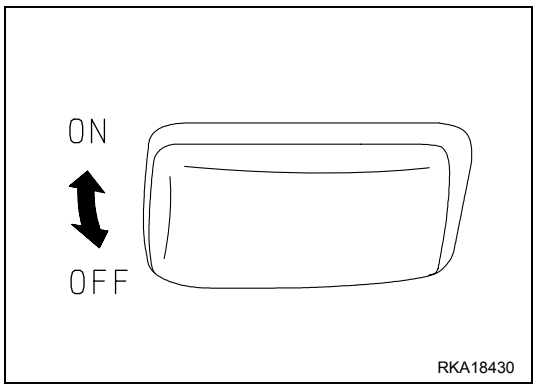
This switch (9) is used to allow the machine to work temporarily in case of failure in the braking system of the turret swing (when “E03” appears on the display) or the boom swing (when "E41" appears on the display) functions.

(a) EMERGENCY abnormal situation (shift the lever switch upward); the boom and turret swing functions can be temporarily operated.

(b) NORMAL: normal situation (shift the lever switch downward).

If the codes “E03” or “E41” appear on the display, shift the lever switch upward to be able to go on working.

10. Overhead light



IMPORTANT

- **Make sure to switch off the overhead light after use. If it is not switched off, the battery will run down.**

The overhead light (10) is used to check the instruments and the inside of the cab when visibility is scarce.

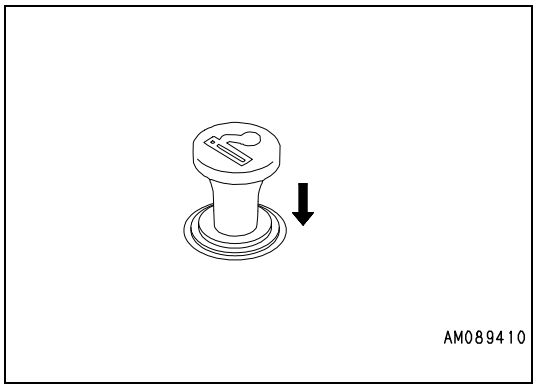
Position ON to switch it on

Position OFF to switch it off

NOTE

- The overhead light can be switched on or can be left on even when the ignition switch is in position OFF, therefore it is important not to forget to switch it off.

11. Cigarette lighter

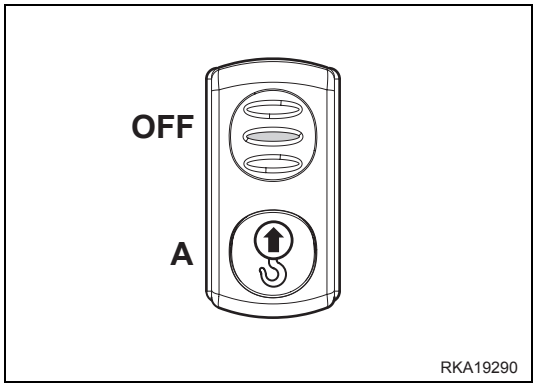


The cigarette lighter (11) is used to light cigarettes. Push it inwards, it will return to its original position after a few seconds. Extract it to light your cigarette.
If the cigarette lighter is removed, the socket can be used as power supply.

IMPORTANT

- **This is a 24 V cigarette lighter. Therefore, be careful not to use the socket as a power source for 12 V electric equipment, since it may be damaged.**
  The capacity of the cigarette lighter is 85 W (24 V x 3,5 A).

12. Overload alarm switch



This switch (12) is used to activate the overload warning light.

The overload warning light can be activated by pressing part (A).

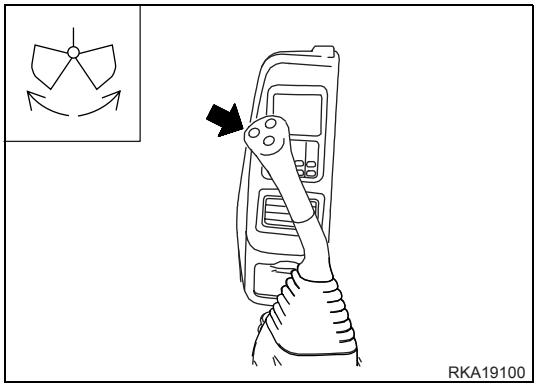
The overload warning light can be deactivated by pressing OFF.

13. POWER OUTLET

There is a power outlet on the top of the cab for the connection of a lighting device for routine and maintenance operations.
It is a two-pole outlet and is in compliance with the ISO 4165-1979 standard. Power supply 24 V.
To activate the power outlet, use the revolving light switch.

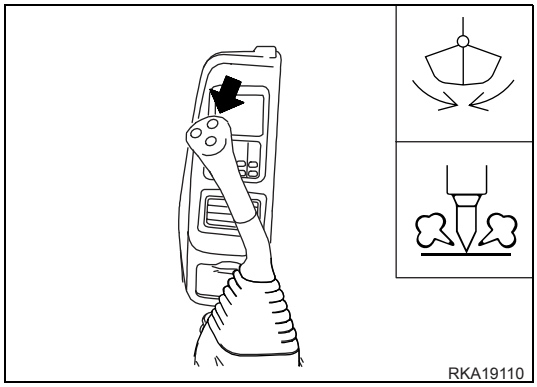
14. CLAMSHELL BUCKET OPENING BUTTON (IF INSTALLED)

This is a single-function button and allows the opening of the clamshell bucket. When it is released, the bucket stops.

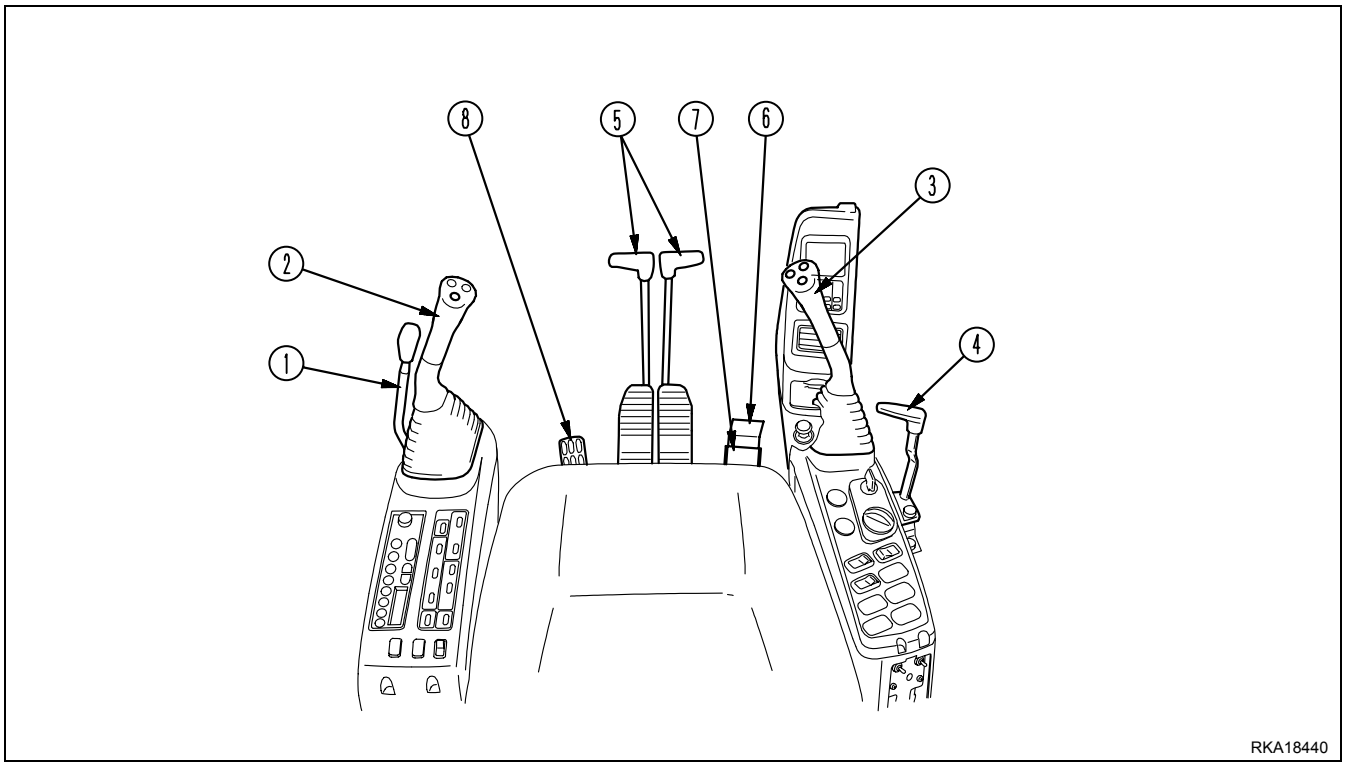


15. CLAMSHELL BUCKET CLAMPING OR DEMOLITION HAMMER CONTROL BUTTON (IF INSTALLED)

This is a single-function button and allows the clamshell bucket to be clamped or the demolition hammer to be operated, according to which equipment is installed on the machine. When it is released, the bucket or the hammer stops.

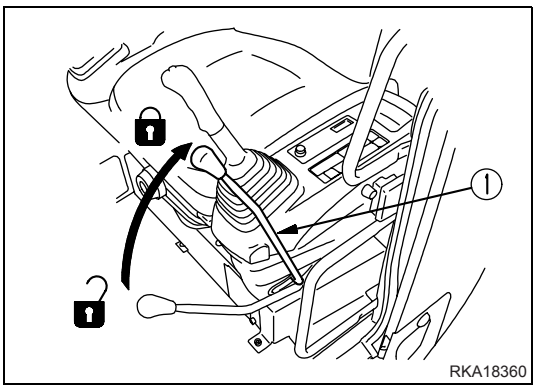


3.2.3 CONTROL LEVERS AND PEDALS



(1) Safety device control lever (safety lever)
(2) Left work equipment control lever
(3) Right work equipment control lever
(4) Blade control lever
(5) Travel levers (with pedals)
(6) Pedal lock
(7) Boom swing control pedal
(8) Two-piece boom control pedal (if installed)

1. Safety device control lever



⚠ WARNING

- **Before leaving the cab, lower the equipment to the ground and shift the safety lever to position “lock”. If the safety lever is not in the “locked” position and the control levers are touched by mistake, this may lead to serious injury.**
- **If the safety lever is not in the “locked” position, the control levers may move, causing accidents or serious injury. Always make sure that the lever is in the “locked” position, as shown in the figure.**
- **When shifting the safety lever, take care to avoid touching the equipment control levers.**

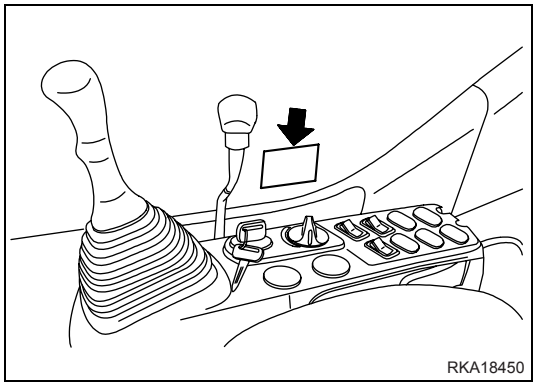
This lever operates the safety device that locks the work equipment, the swing and travel functions and the attachments. When pulled upwards, it is in “locked” position.
The safety device is hydraulic, therefore even if the control levers and the pedals move, the work equipment and the machine cannot be operated.

NOTE
- If the safety lever on the right or left side is not in the “locked” position, the engine cannot be started. Before operating the ignition switch, always make sure that the safety lever is in the “locked” position. If the engine stops while the safety lever is in “free” position, shift the lever back to the “locked” position before operating the ignition switch.

2-3. Work equipment control levers

⚠ WARNING

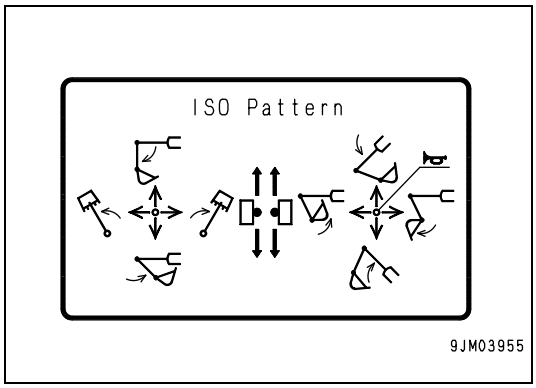
- **Before carrying out any manoeuvre with these levers, the operator must seat in the work position and fasten the seat belt.**
- **Before leaving the driver seat, lower the equipment to the ground, lock the controls with the safety lever and stop the engine.**


RKA18450

The control lever (2) is positioned on the operator's left and controls the arm and the turret swing.

- Swing function
  (a) Swing to the right
  (b) Swing to the left
- Arm
  (c) Fold
  (d) Extend

N (Neutral): the turret and the arm are held in the position where they stopped.

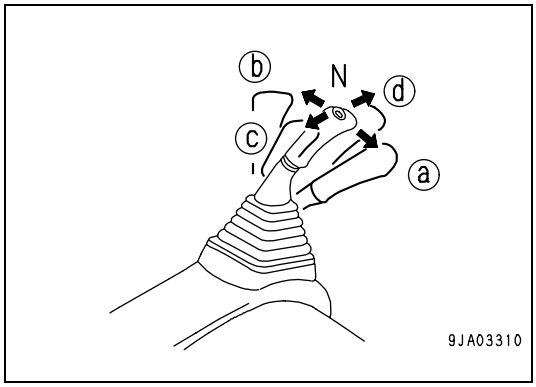


9JM03955

The control lever (3) is positioned on the operator's right and controls the boom and the bucket.

- Boom
  (e) Lift
  (f) Lower
- Bucket
  (g) Open
  (h) Fold

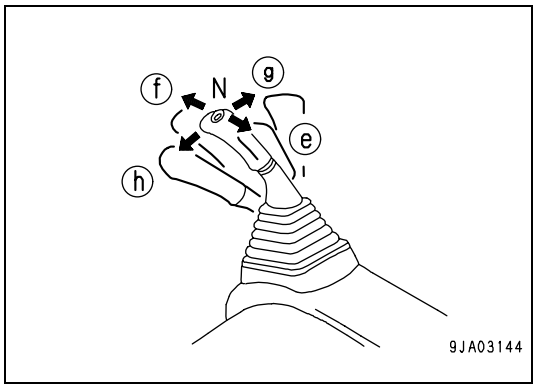
N (Neutral): the boom and the bucket are held in the position where they stopped.



9JA03310

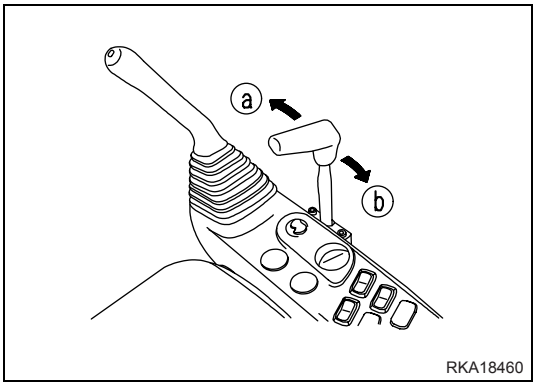
IMPORTANT

- **The horn push button is positioned on the right lever grip and must be used to warn all the people in the vicinity before starting work and in case of danger.**
- **When the safety lever is in the "locked" position, all the movements are inhibited (see "3.2.3 pos. 1. Safety device control lever").**



9JA03144

4. Blade control lever



⚠ WARNING

- **Before moving the machine, make sure that the blade is completely raised.**

It is used to control the movements of the blade.

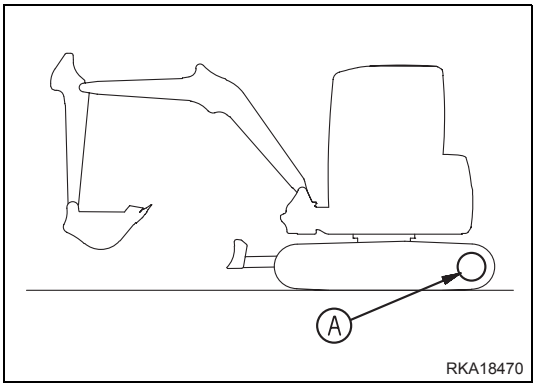
(a) Lower

(b) Lift

IMPORTANT

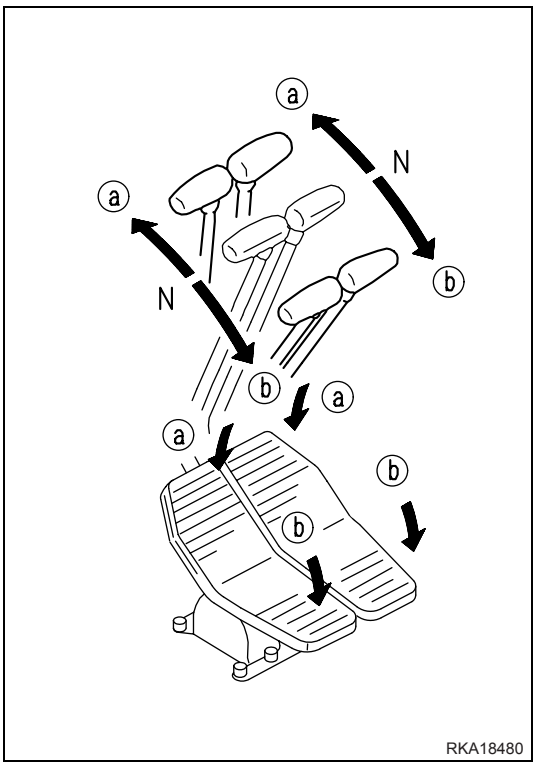
- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos. 1. Safety device control lever").**

5. Travel levers



⚠ WARNING

- **Before carrying out any manoeuvre with these levers, the operator must seat in the work position and fasten the seat belt.**
- **Before moving the machine, make sure that the sprocket (A) is positioned at the rear of the machine and that the safety locks are engaged; if the turret is rotated by 180°, the controls are inverted (see "3.3.10.1 HOW TO MOVE THE MACHINE" e "3.3.11.1 STEERING").**
- **Use the travel control pedals only when the machine is moving. If a pedal is inadvertently pressed when the machine is not moving or steering, this may move suddenly and cause serious accidents.**
- **When travelling or carrying out steering manoeuvres, use the pedals with the maximum care.**



These levers are used to operate the travel motors (right and left) and control the forward and reverse travel according to the movements indicated.

(a) FORWARD: levers pushed forward

(b) REVERSE: levers pulled towards the operator

N (Neutral): machine at rest.

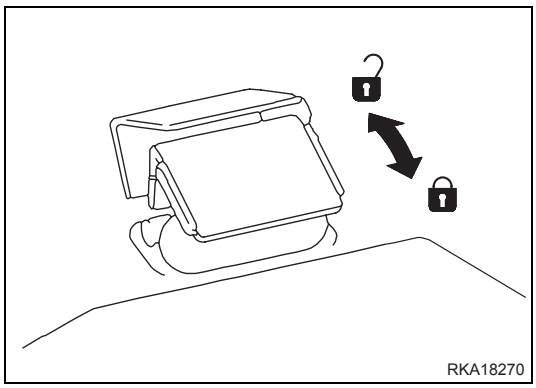
IMPORTANT

- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos. 1. Safety device control lever").**

NOTE

- On machines equipped with travel alarm, shifting the lever to the forward travel or reverse position makes the alarm sound to signal that the machine is starting to move.

6. Pedal lock
(For the boom swing control pedal)

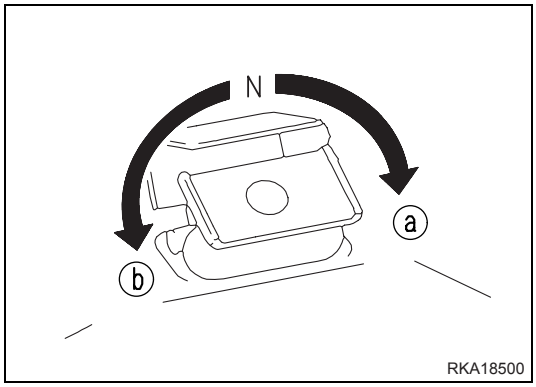


⚠ WARNING

- **Always shift the safety lever to position “lock” when the boom swing is not required, during travel and when parking the machine. If the control pedal is inadvertently pressed, this may cause serious accidents.**

This device is used to lock the movements of the boom swing control pedal.

7. Boom swing control pedal



⚠ WARNING

- **When the boom is swung to the left with retracted work equipment, if the bucket is wider than a standard bucket it may come into contact with the cab.**
- **Always check the distance between the bucket and the cab and work manoeuvring the equipment with care.**

This pedal controls the boom swing to the right and to the left, according to the movements indicated below.

(a) Swing to the right

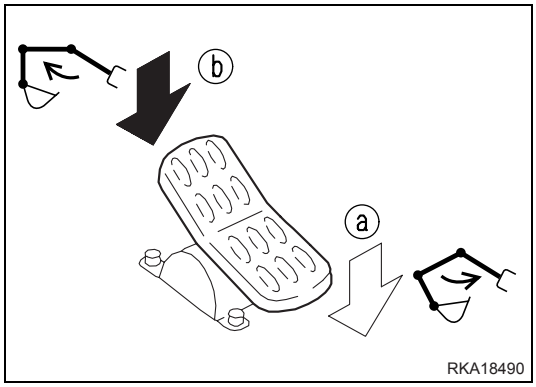
(b) Swing to the left

N (Neutral): boom at rest.

IMPORTANT

- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos. 1. Safety device control lever").**
- **The boom swing is useful to displace the digging line beyond the track outline; do not use this function during the work cycle.**

8. Two-piece boom control pedal
(if installed)



It controls the extension and folding of the two-piece boom according to the movements indicated.

(a) Boom folding

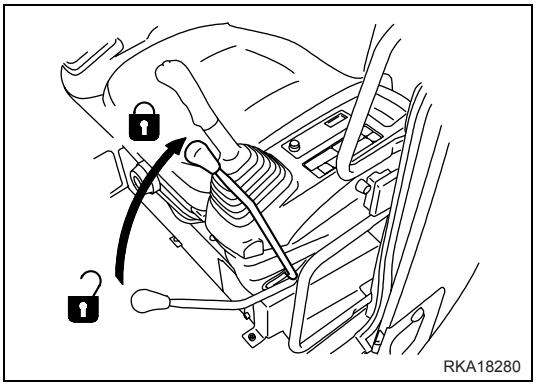
(b) Boom extension

N (Neutral): boom at rest.

IMPORTANT

- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos. 1. Safety device control lever").**

3.2.4 WINDSHIELD

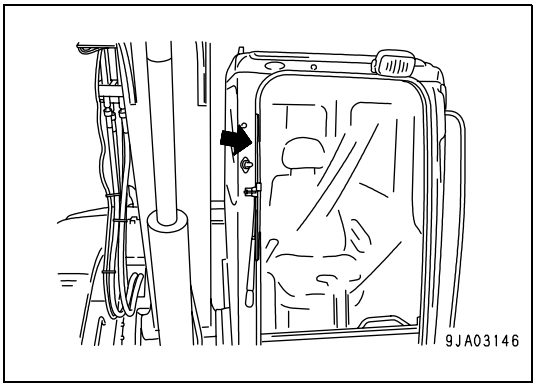


⚠ WARNING

- **When opening or closing the upper windshield, the lower windshield or the cab door, always lock the controls with the safety device lever (L). If the control levers are not locked and are inadvertently operated, there is the risk of serious accidents.**
- **Before opening or closing the windshield, stop the machine on a level surface, lower the work equipment completely to the ground and stop the engine.**
- **When opening the windshield, hold it firmly with both hands, pull upward and do not leave hold until the automatic retainer is locked.**
- **When closing the windshield, hold the handle with both hands and close securely.**

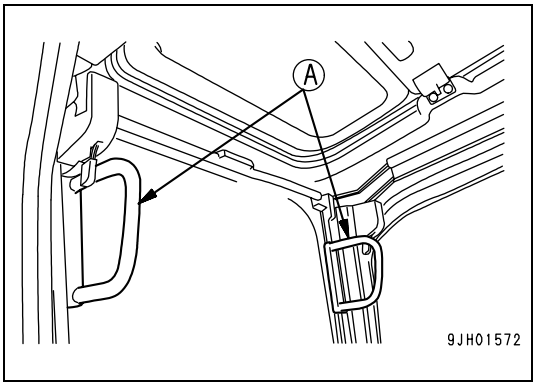
The upper windshield can be positioned under the cab roof.

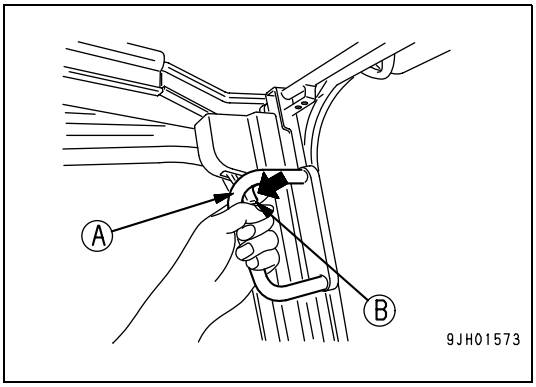
The lower windshield can be removed and stored inside the cab, on the left.



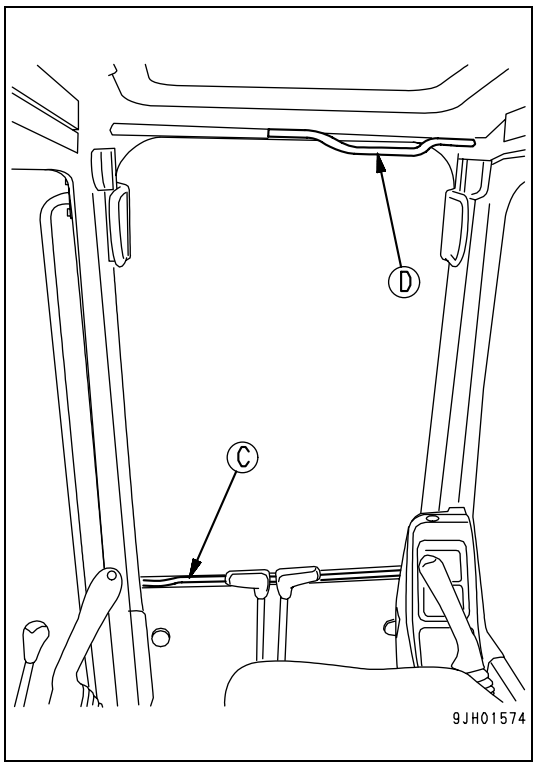
Opening

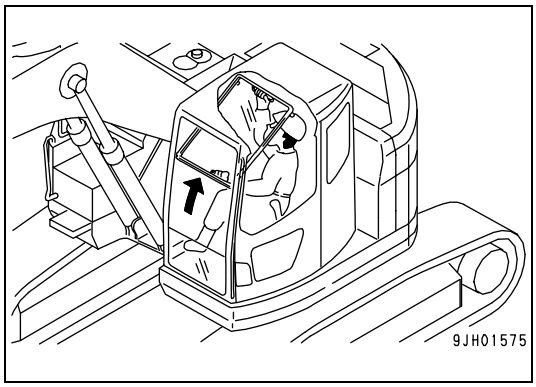
1. Stop the machine on a level surface, lower the equipment completely to the ground, then stop the engine.
2. Shift the safety lever to the “locked” position.
3. Make sure that the windshield wiper is positioned correctly.
4. Seize the handles (A) on the top right and left of the front windshield, then pull the locking levers (B) towards yourself to release the front windshield. The upper part of the front windshield can be extracted.

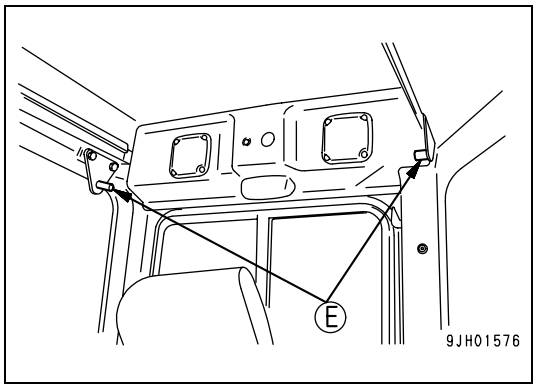




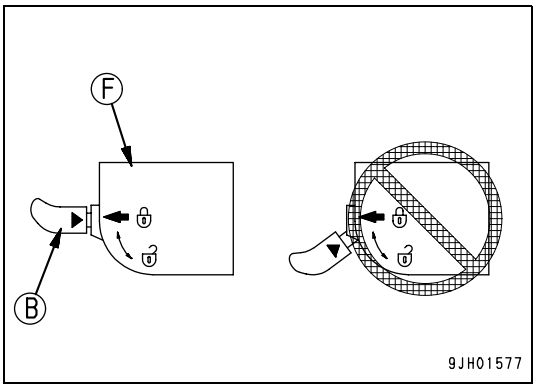
5. Seize the lower handle (C) with your left hand from the inside of the cab and with your right hand seize the upper handle (D), pull it upwards and push it against the retainer (E) until engaging the glass.







6. Make sure that the safety lever is in the “locked” position.



NOTE

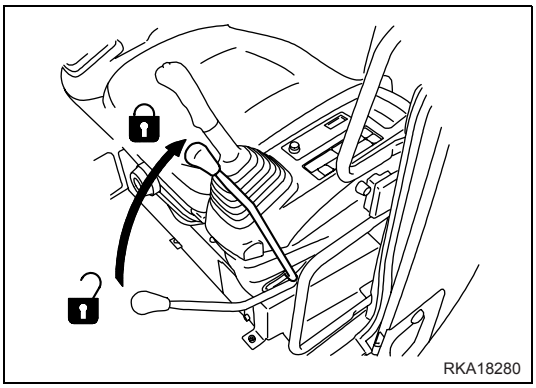
- The retainer has been correctly fitted if the arrow on the retainer (F) corresponds to the arrow on the locking lever (B).
- If the arrow on the retainer (F) does not correspond to the arrow on the locking lever (B), this means that the retainer hasn’t been fitted correctly. To engage the retainer correctly, repeat the operation described at point 5.

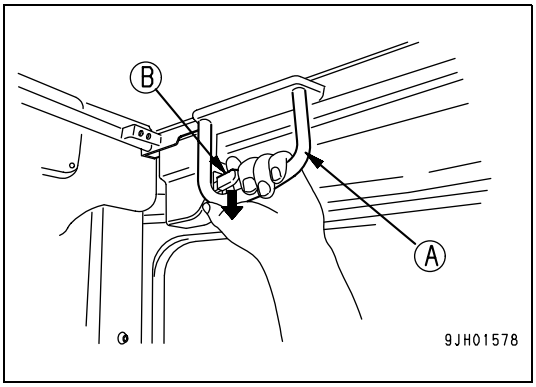
Closing

⚠ WARNING

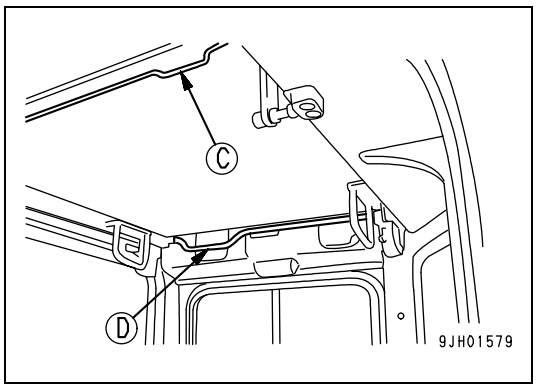
- **When closing the windshield, lower it slowly and pay attention to your hands.**

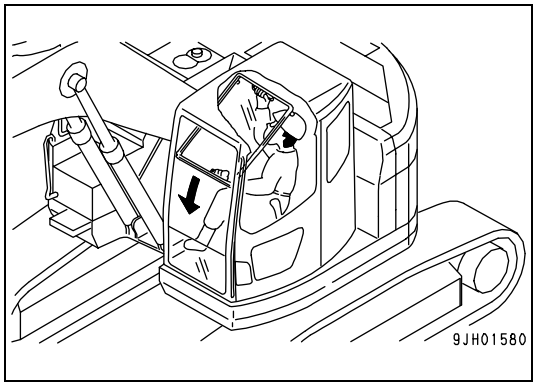
1. Stop the machine on a level surface, lower the equipment completely to the ground, then stop the engine.
2. Shift the safety lever to the “locked” position.
3. Seize the right and left handles (A) and shift the locking lever (B) downwards to release the retainer.



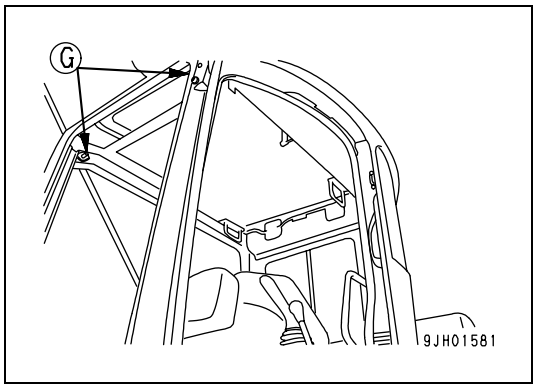


4. Seize the handle (C) at the bottom of the front glass with your left hand and the handle (D) on the upper part of the same with your right hand, push forward, then lower slowly.





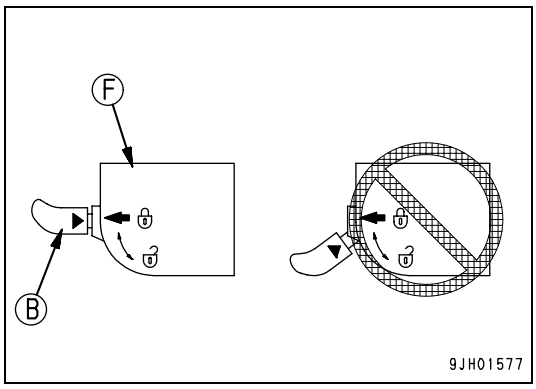
5. When the lower part of the glass reaches the upper part of the lower glass, push the upper part of the glass forward against the right and left locks (G) and engage the retainer.



6. Make sure that the safety lever is in the “locked” position.

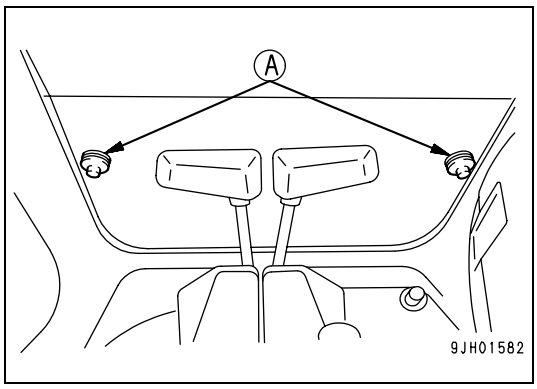
NOTE

- The retainer has been correctly fitted if the arrow on the retainer (F) corresponds to the arrow on the locking lever (B).
- If the arrow on the retainer (F) does not correspond to the arrow on the locking lever (B), this means that the retainer hasn’t been fitted correctly. To engage the retainer correctly, repeat the operation described at point 5.

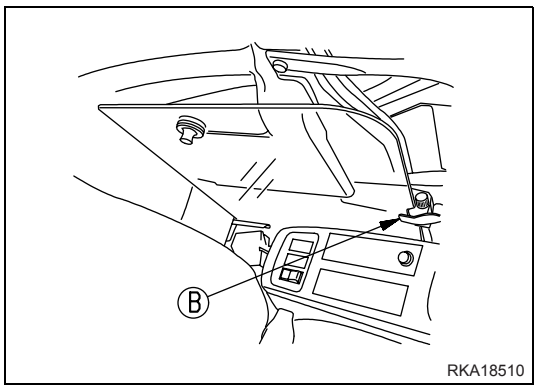


Removing the lower windshield

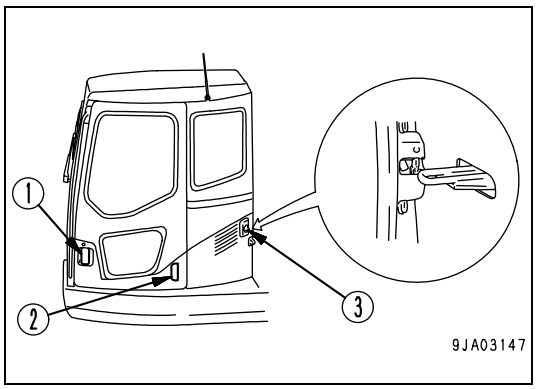
1. Open the front windshield, then seize the grip (A), pull up and remove the lower windshield.



2. After removing the lower windshield, position it on the left inner side of the cab, then secure it with the locking lever (B).



3.2.5 SLIDING DOOR



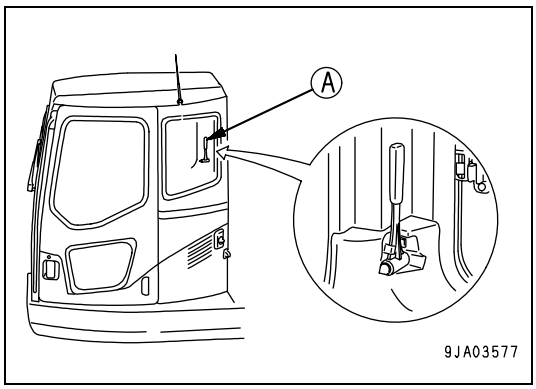
⚠ WARNING

- **Make sure that the sliding door is locked in the correct position both when open and when closed.**
- **Always stop the machine on a level surface when it is necessary to open or close the door.**
  If the door is opened or closed on a slope, the operating effort may change suddenly. Do not open or close the door on slopes.
- **Always use the handle (1) and the knob (2) to open or close the door.**
- **Be careful to your hands, in order to prevent them from being caught between the door and the front or centre pillar.**
- **If there is anyone inside the cab, warn him/her before opening or closing the door.**

Lock

When closing the door, pull the handle backward to release the lock (3), then pull the door forward.

3.2.6 EMERGENCY EXIT HAMMER

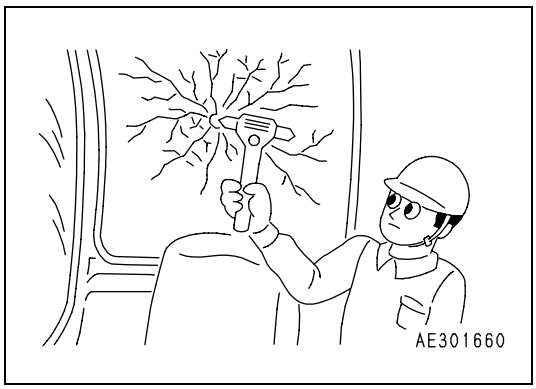


⚠ WARNING

- **When it is necessary to break a window with the hammer, be careful not to get injured by glass chips.**
- **Before leaving the operator cab, remove any glass fragments from the window edges and take care not to injure yourself. Be careful not to slip on the glass fragments scattered on the ground.**

If for any reason whatsoever it should be impossible to open the cab door and it should be necessary to leave the cab because of an emergency, use the hammer (A).

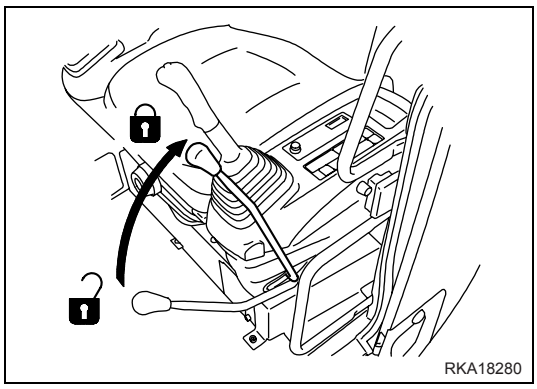
To get out of the cab, break the glass with the hammer (A) and pass through the resulting opening.



3.2.7 SIDE WINDOW

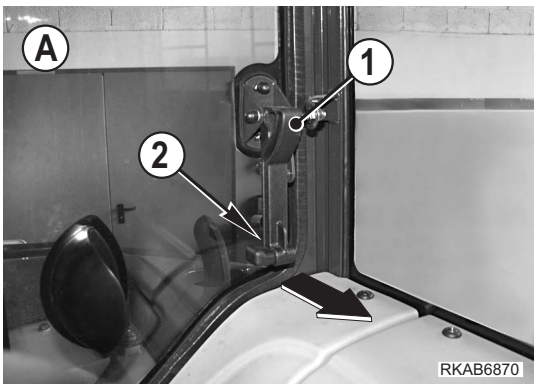
⚠ WARNING

- **When opening or closing the side window, always shift the safety lever to position “lock”. If the control levers are not locked and are inadvertently operated, there is the risk of serious accidents.**

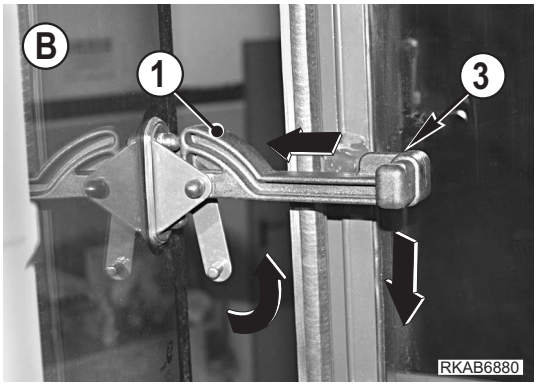


The rear part of the side window can be opened either partially or completely.
To open the window partially, proceed as follows:

1. Release the lever (1) from the lower coupling pin (2), following the direction of the arrow shown in Figure (A).

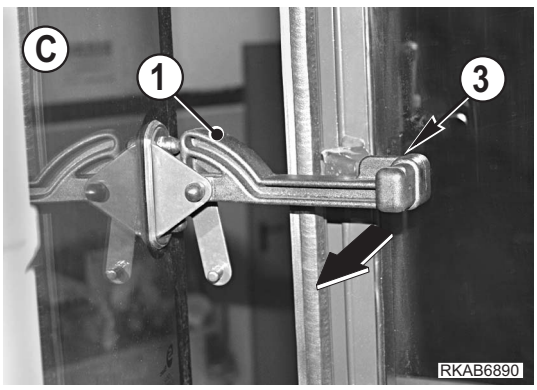


2. Lift the lever (1) with a simple sliding movement and at the same time push the lever toward the outside of the cab.
   After lifting the lever (1), push its end downward in order to engage it in the upper coupling pin (3), as shown in Figure (B).

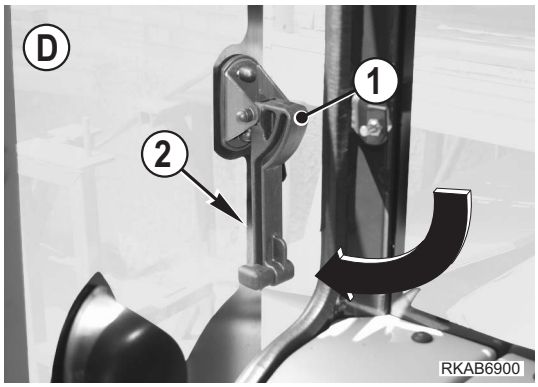


If it is necessary to open the rear part of the side window completely, proceed as follows:

1. Release the lever (1) from the upper coupling pin (3) following the direction of the arrow shown in Figure (C).

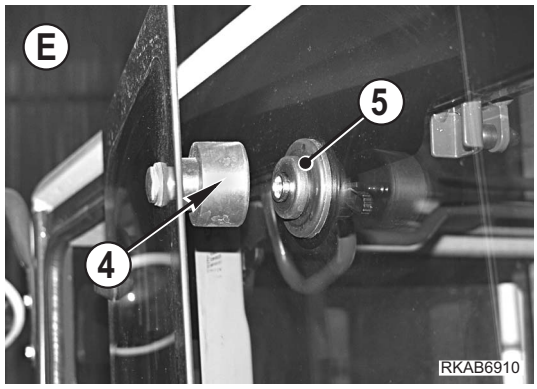


2 - With the window open, lower the lever (1) until engaging it in the lower coupling pin (2), as shown in Figure (D).



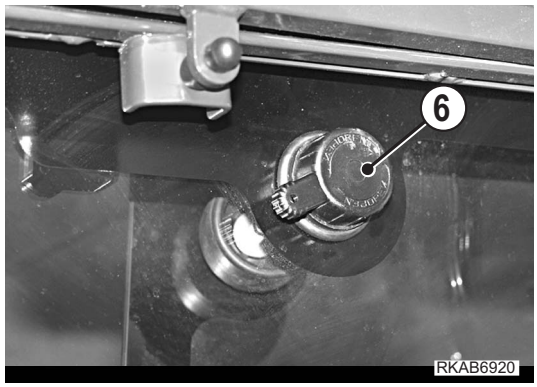
3 - Rotate the window towards the front of the machine, until engaging the coupling (4) in the rubber element (5), as shown in Figure (E).

To close the window, turn the knob (6) and release the rubber element (5) from the coupling (4). Close the side windows and couple the lever (1) to the lower pin (2), as indicated in Figure (A).



IMPORTANT

- **When the rear window is partially open or completely closed, it must always be locked by coupling the lever (1) with the lower (2) or upper (3) pin.**
- **When the rear window is rotated towards the front of the machine in order to open it completely, make sure that it is fixed in the relevant rubber element (5).**
- **Periodically lubricate the rubber element (5) with specific greases, in order to facilitate the coupling operation.**

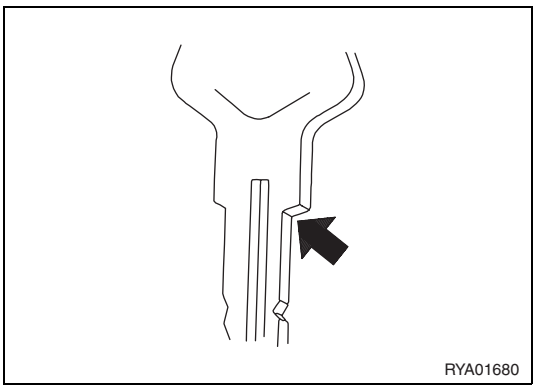


3.2.8 CAP WITH LOCK

Use the ignition key to open and close the caps and covers with lock.

For details on the position of caps and covers with lock, see"3.3.23 LOCKING THE MACHINE".

Insert the key completely into the lock and turn it. If the key is turned before having been inserted completely, it may break.



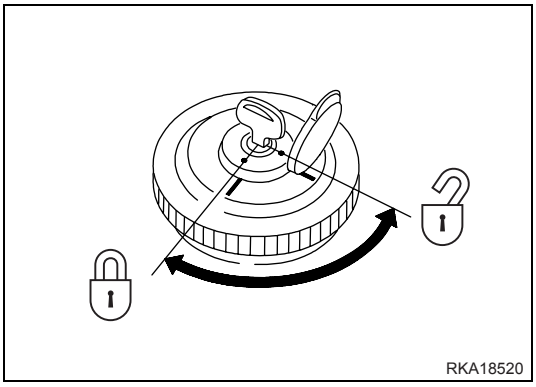
OPENING AND CLOSING THE CAPS WITH LOCK

Opening

1. Insert the key into the lock.
2. Turn the key counterclockwise and open the cap.

Closing

1. Tighten the cap thoroughly and insert the key into the lock.
2. Turn the key clockwise and extract it.



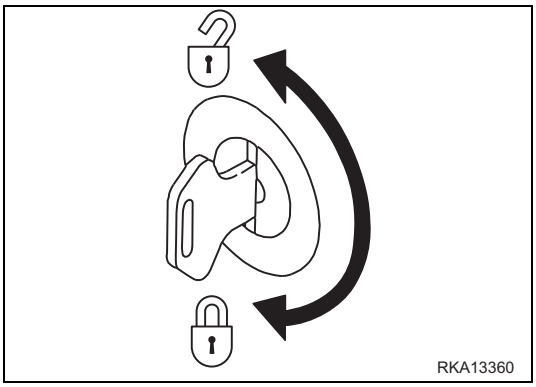
OPENING AND CLOSING THE COVERS WITH LOCK

Opening

1. Insert the key into the lock.
2. Turn the key counterclockwise and open the cover by pulling the grip.

Closing

1. Close the cover and insert the key into the lock.
2. Turn the key clockwise and extract it.



3.2.9 ENGINE HOOD

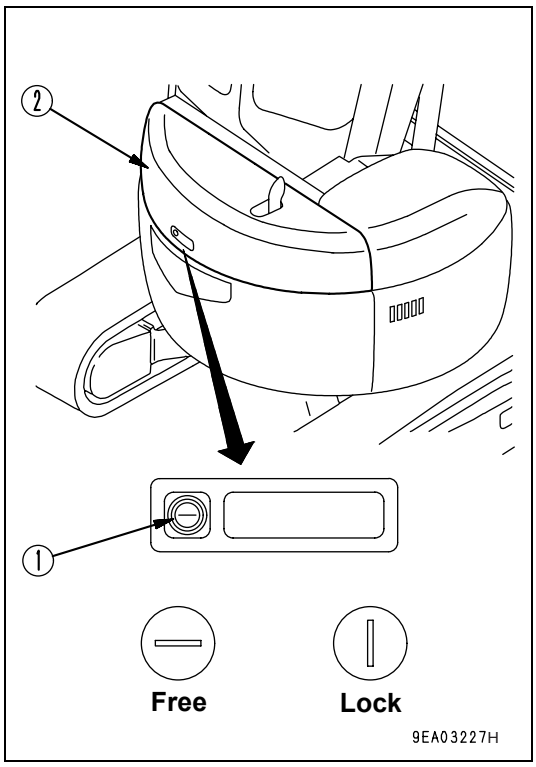
⚠ WARNING

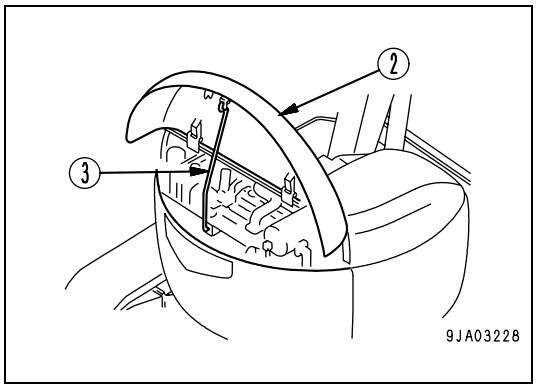
- **Do not open the engine hood when the engine is running.**
- **Do not use the machine without engine hood and do not start the engine when the hood is open, unless this is expressly prescribed for certain maintenance operations.**
- **When carrying out an inspection or maintenance operation inside the engine hood, always open it completely and make sure that it is kept open by the apposite rod.**
- **Non-compliance with these rules may lead to serious accidents.**

IMPORTANT

- **The hood should be kept locked, unless there is a precise reason for opening it.**
  To make sure that it is locked, check the direction of the slot on the opening button.

1. Release the engine hood lock (1).
   (For further details, see "3.2.8 CAP WITH LOCK").
2. Press the engine hood opening button (1) to open the hood (2).
3. After opening the hood, use the stay rod (3) to keep it open.
4. To close the hood (2), remove the stay rod (3), insert it in the apposite retainer, then lower the hood slowly and press it downwards to make the lock snap.





3.2.10 SIDE COVER

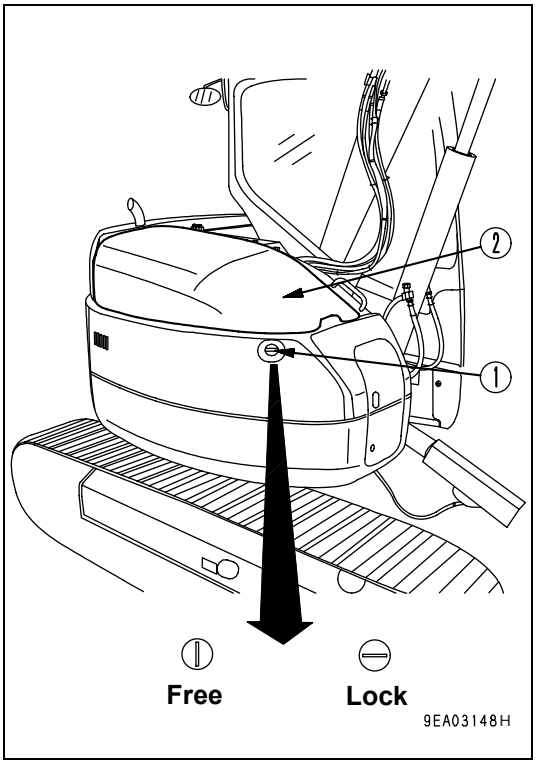
⚠ WARNING

- **Avoid climbing up the cover, since there is the risk of slipping.**
- **When carrying out an inspection or maintenance operation inside the side cover, always open it completely and make sure that it is kept open by the apposite lever.**

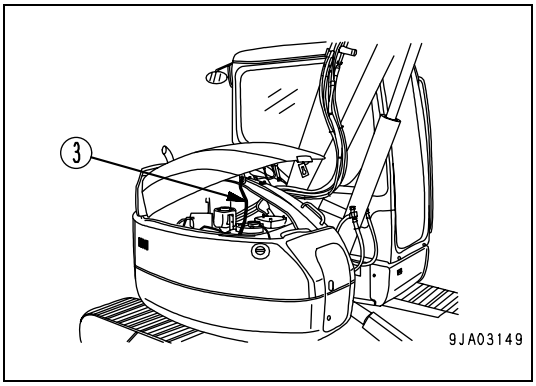
IMPORTANT

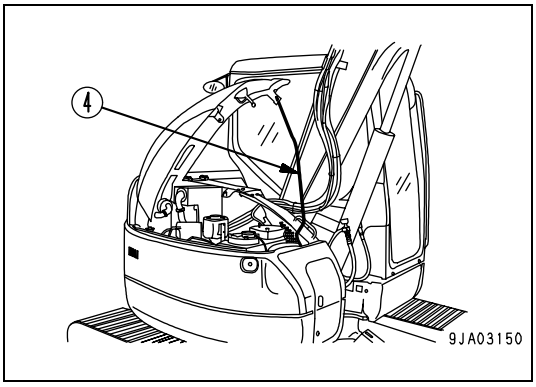
- **The side cover should be kept locked, unless there is a precise reason for opening it.**
  To make sure that it is locked, check the direction of the slot on the opening button.

1. Release the lock (1) of the side cover.
   (For details, see "3.2.8 CAP WITH LOCK").
2. Press the opening button (1) of the side cover (2) and open it.

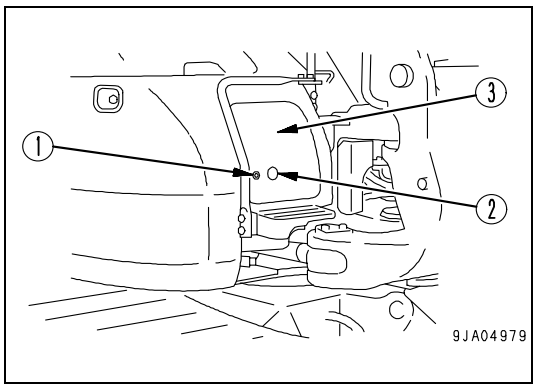


3. The side cover can be kept open in two different positions using the stay rod (3) or (4).
   After opening the side cover (2), insert the stay rod (3) or (4) to lock it in the desired position.
4. To close the side cover (2), remove the stay rod (3) or (4), insert it in the apposite retainer, then lower the cover slowly and press it downwards to make the lock snap.





3.2.11 BATTERY INSPECTION COVER

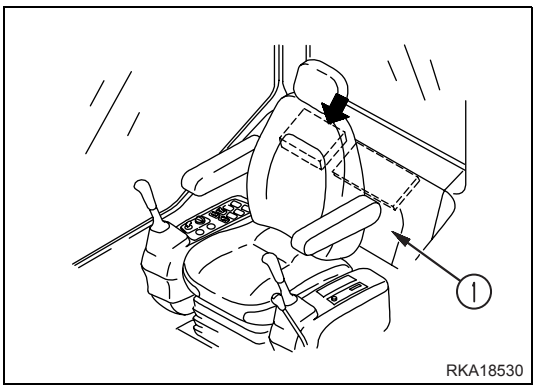


IMPORTANT

- **Keep the cover locked.**
  Open it only if necessary.

1. Release the lock (1) of the cover.
   (For details, see "3.2.8 CAP WITH LOCK").
2. Insert a finger in the hole (2) and pull to open the cover (3).
3. Close the cover (3).
   Do not forget to lock the cover.

3.2.12 FUSES



IMPORTANT

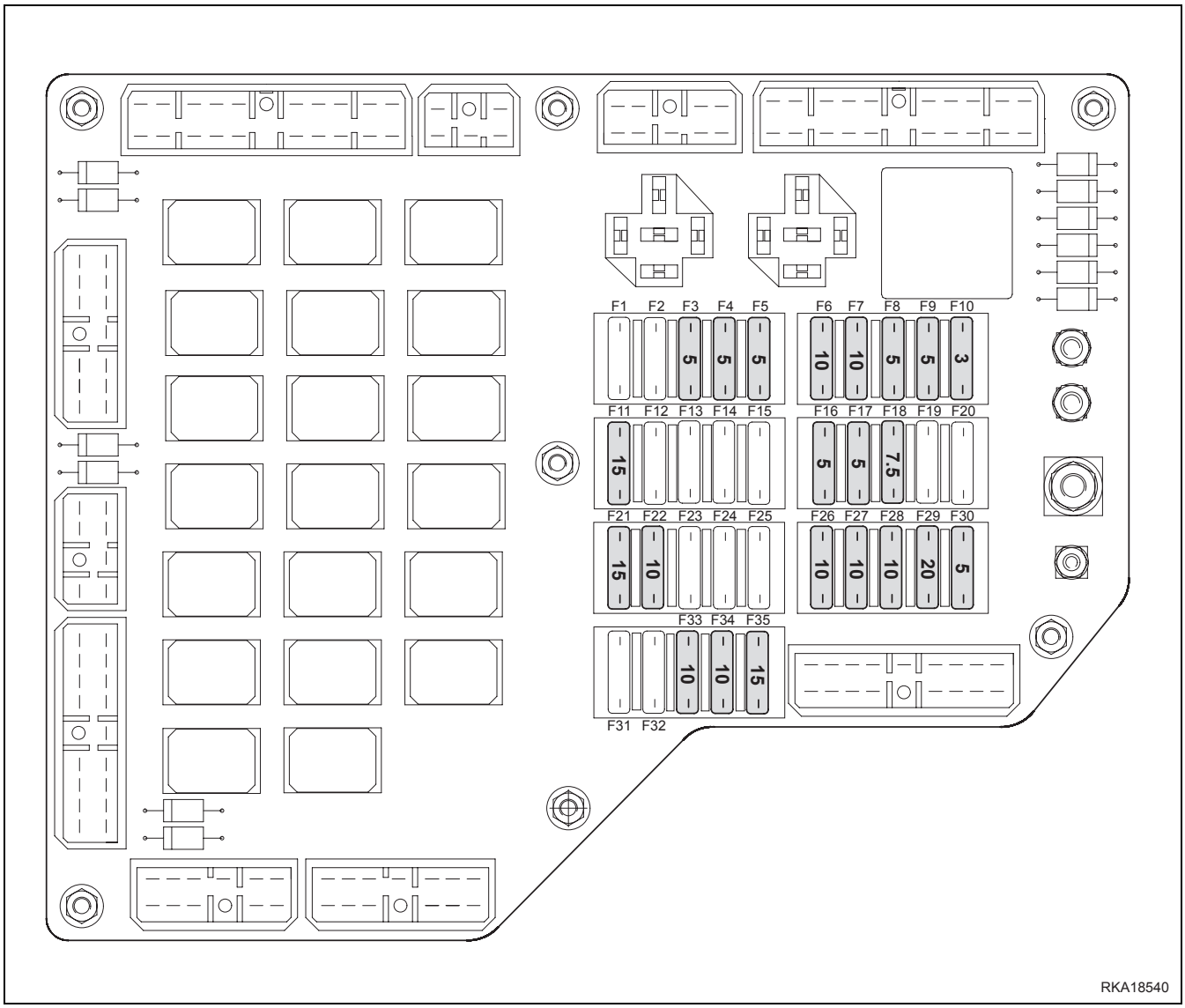
- **When changing a fuse, make sure that the ignition key is in position OFF.**
- **If the fuses are oxidized, corroded or do not fit perfectly in their seat, replace them only with new fuses having the same capacity.**
- **If the engine doesn't run when the ignition switch is turned to position START, check the main fuse and replace it, if necessary.**

The fuses are grouped on a single base positioned inside the cab's rear compartment and can be reached by removing the cover (1).

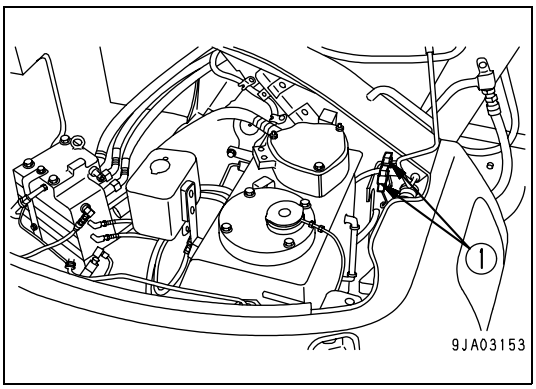
Fuse capacity and circuits involved

POSITION	COLOUR	CAPACITY (A)	CIRCUIT INVOLVED
F1	-	-	-
F2	-	-	-
F3	Orange	5	Bucket swing power supply
F4	Orange	5	Horn power supply
F5	Orange	5	Bucket opening and folding power supply
F6	Red	10	Monitor power supply (VB+)
F7	Red	10	Revolving light switch warning lights power supply.
F8	Orange	5	Overhead light power supply
F9	Orange	5	Radio power supply (directly from the battery)
F10	Violet	3	Controller power supply (VB)
F11	Light blue	15	Acceleration-deceleration relay power supply
F12	-	-	-
F13	-	-	-
F14	-	-	-
F15	-	-	-
F16	Orange	5	Right and left PPC power supply
F17	Orange	5	Controller power supply (VIS)
F18	Brown	7,5	Emergency guide pump switch power supply
F19	-	-	-
F20	-	-	-
F21	Light blue	15	Work lights power supply
F22	Red	10	PPC buttons power supply
F23	-	-	-
F24	-	-	-
F25	-	-	-
F26	Red	10	Work lights power supply
F27	Red	10	Monitor power supply
F28	Red	10	Optional equipment, revolving light and radio power supply
F29	Yellow	20	Fans power supply
F30	Orange	5	Air conditioning power supply (electronic)
F31	-	-	-

F32	-	-	-
F33	Red	10	Controller power supply (VIS)
F34	Red	10	Cigarette lighter and windshield washer power supply
F35	Light blue	15	Engine stop power supply



3.2.13 MAIN FUSE

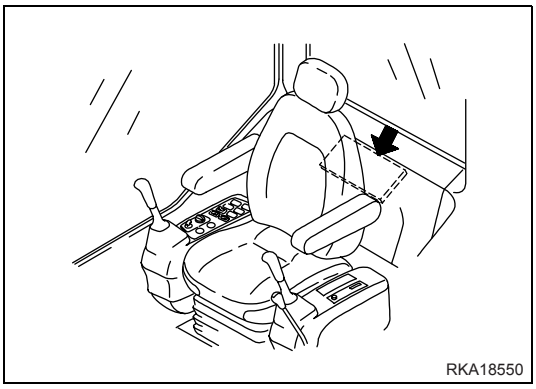


If the starter does not run when the ignition switch is turned to position ON, the fuse (1) may have blown. Open the cover on the right side of the machine to check the fuse and change it if necessary.

NOTE

- The main fuse is the high-capacity fuse installed to protect the electric components and the wiring.

3.2.14 CONTROLLER



IMPORTANT

- **Avoid letting water, mud or liquids fall on the controller, since this may cause damage.**
- **If any anomaly is observed on the controller, contact your Komatsu Dealer.**

The controller is positioned behind the operator seat.

3.2.15 VENTILATION AND HEATING

The ventilation and heating of the cab serve to reduce the operator's stress both in summer and in winter; these functions also serve to eliminate condensate from the front windshield, thus ensuring visibility during both work and travel.

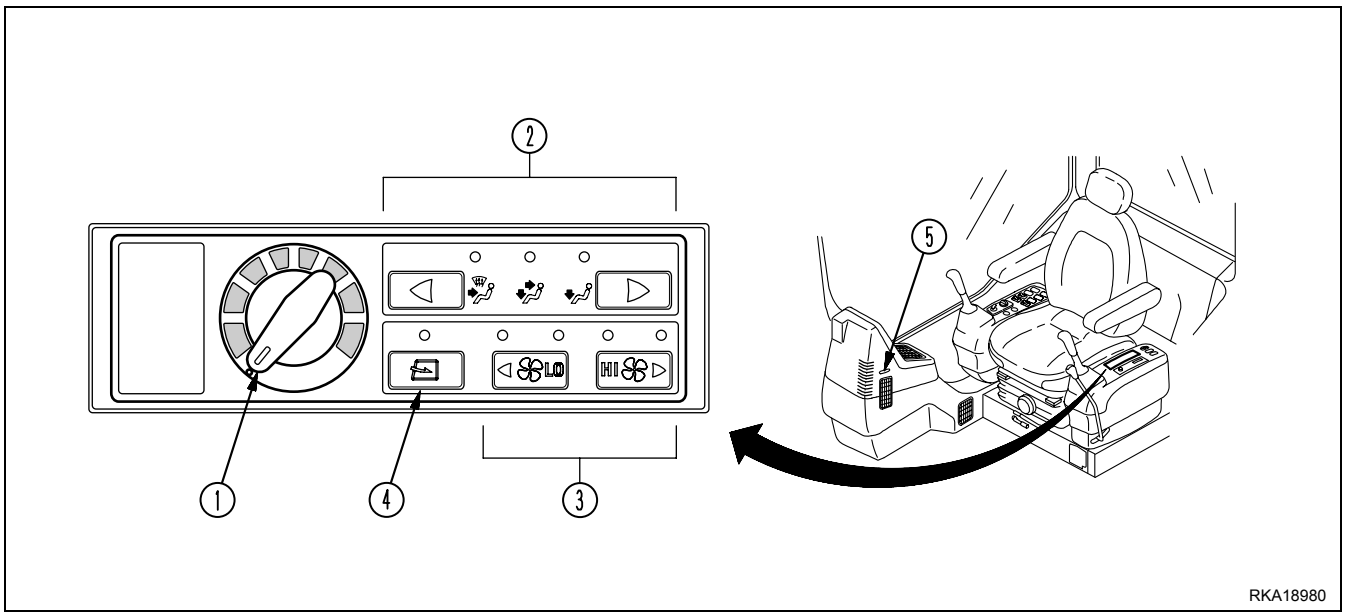
Air distribution is obtained by means of a series of adjustable vents with variable air flow, both for the air flow inside the cab and for the air flows with defrosting and defogging function.

The ventilation and heating system can also include a function for the recirculation of the air inside the cab. This function ensures quicker heating and is very useful when working in areas where air pollution is considerable (tunnels, dusty places, small or badly ventilated rooms, etc.).

IMPORTANT

- **Do not use the air recirculation function for long periods in rainy or cold days, since this would increase the fogging of the inside of the windows.**

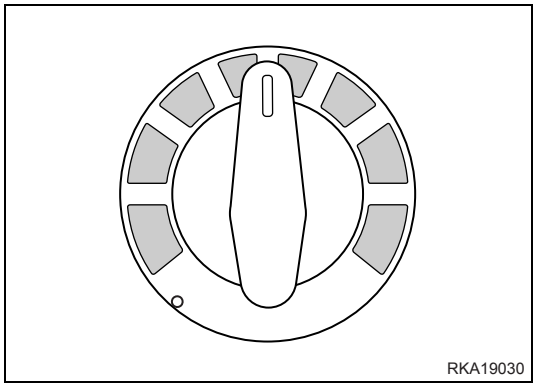
3.2.15.1 HEATING AND DEFROSTING CONTROL PANEL



(1) Temperature control switch
(2) Ventilation selection switches
(3) Air flow selection switches
(4) Air recirculation selection switch
(5) Defrosting lever

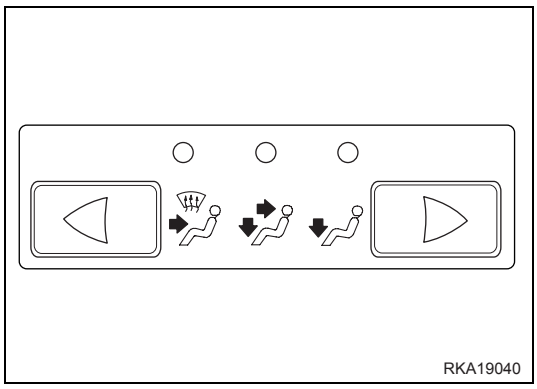
1. Temperature control switch

This is a rotary switch used to start and stop the heating system and to control the temperature inside the cab.
The position, ON or OFF, is signalled by a click of the switch when this is turned completely anticlockwise. The temperature can be adjusted by turning the switch. Turning the switch clockwise (red range) increases the temperature, while turning it anticlockwise (light blue range) decreases the temperature.

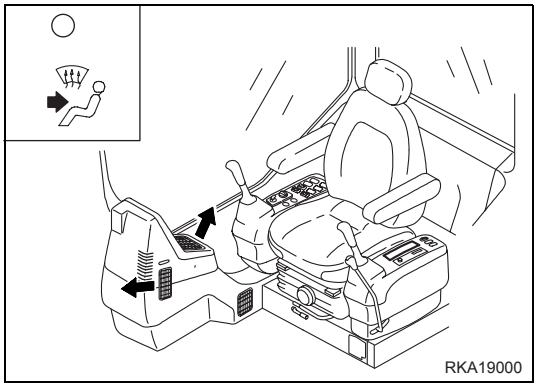


2. VENTILATION SELECTION SWITCHES

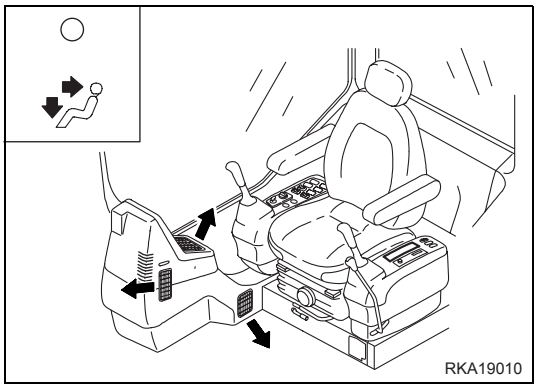
These switches are used to select the direction of the air coming from the heater, and the selection is indicated by a LED.
The LEDs slide progressively and follow the direction of the arrows stamped on the switches. The selected flow is indicated by the coming on of the corresponding LED.
Three directions of the flow can be selected:



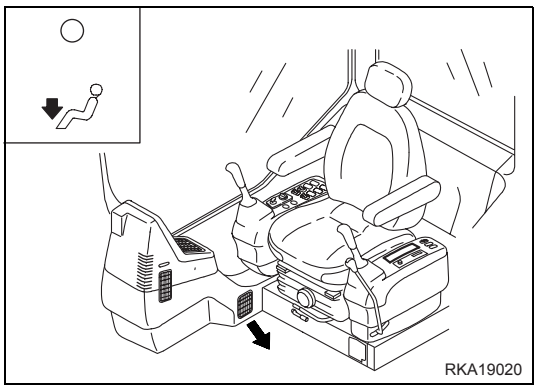
1. Air flow towards the operator’s face.



2. Air flow towards the operator’s face and feet.

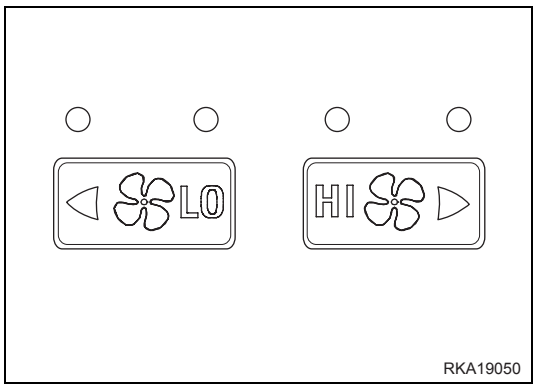


3. Air flow towards the operator’s feet.



3. AIR FLOW SELECTION SWITCHES

These switches are used to select the intensity of the air flow coming from the heater and four ventilation levels are available.
The LO (low) switch is used to decrease the air flow, while the HI (high) switch is used to increase the air flow.
The selected flow is indicated by the coming on of the corresponding LED.
The LEDs slide progressively and follow the direction of the arrows stamped on the switches.

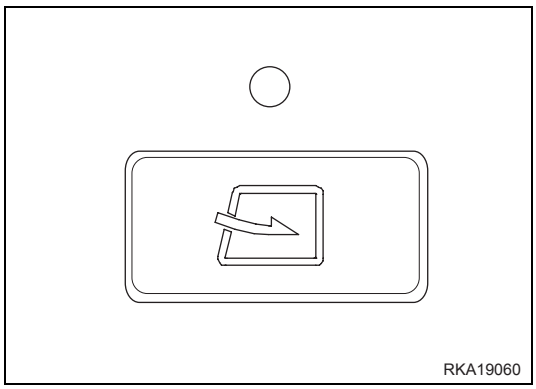


4. AIR Recirculation selection switch

This is an ON-OFF switch and is used to activate the air recirculation inside the cab, which is useful to heat the cab more quickly and when working in extremely polluted areas.

IMPORTANT

- **Do not use the air recirculation function for long periods in rainy or cold days, since this would increase the fogging of the inside of the windows.**

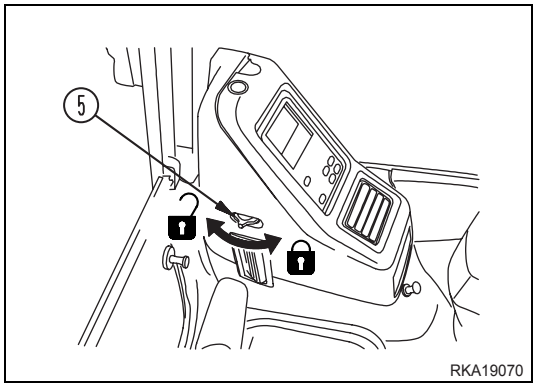


5. Defrosting lever

The lever (5) is used to activate the defrosting function of the front windshield in case of cold or rainy weather.

Lever pushed forward: Defrosting function on.

Lever pulled backward: Defrosting function off.



3.2.16 AIR CONDITIONER (if installed)

⚠ DANGER

- **The coolant used in the air conditioning system is very dangerous. If it is sprayed into the eyes or in case of contact with the skin, wash with plenty of water and consult a doctor without delay. Furthermore, to avoid any explosion, do not generate sparks and do not use naked flames near the air conditioner.**
- **The coolant contained in the air conditioning system is considered special waste and must be collected and disposed of according to the antipollution regulations in force.**
- **For specific maintenance operations to be performed on the air conditioning system, contact your Komatsu Dealer. Non-compliance with these instructions may cause serious damage and even death.**

The cab ventilation and cooling functions have the specific purpose to reduce the operator's stress when the outside temperature is particularly high.

The internal air recirculation ensures quicker cooling and is very useful when working in areas where air pollution is considerable (tunnels, dusty places, small or badly ventilated rooms, etc.).

Air distribution is obtained by means of a series of adjustable vents with variable flow rate, both for the air flow inside the cab and for the air flow with defogging function.

IMPORTANT

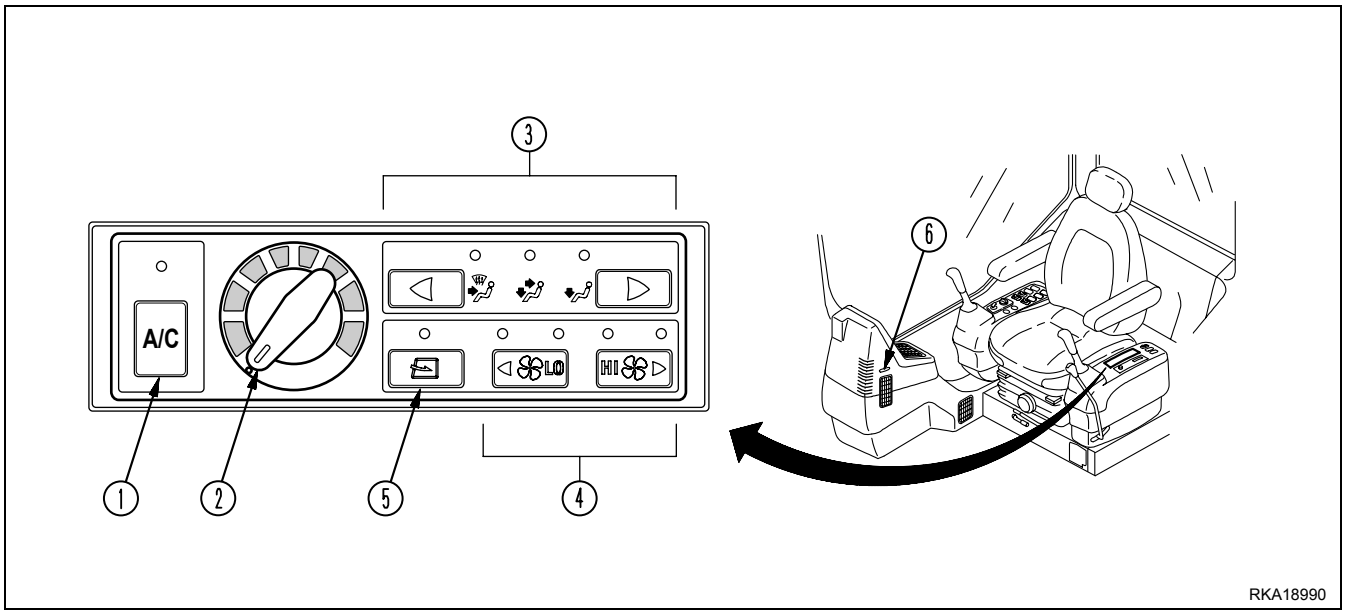
- **At the beginning of the summer and before using the air conditioner, clean the intake filters (see "4.9.9.d CLEANING THE INSIDE AND OUTSIDE FILTERS OF THE AIR CONDITIONER").**
- **Do not use the air recirculation function for long periods in rainy or cold days, since this would increase the fogging of the inside of the windows.**

The air conditioner can be started by means of the switch (A/C) positioned on the left cabinet.
After starting the air conditioner (switch LED on), adjust the temperature and the ventilation flow. The ideal temperature must be 5 or 6°C below the outside temperature.

⚠ CAUTION

- **Even in the periods in which the air conditioner is not used, operate the compressor at low speed for approximately 3-5 minutes at least once a month. This operation ensures the constant lubrication of all the moving parts of the compressor.**

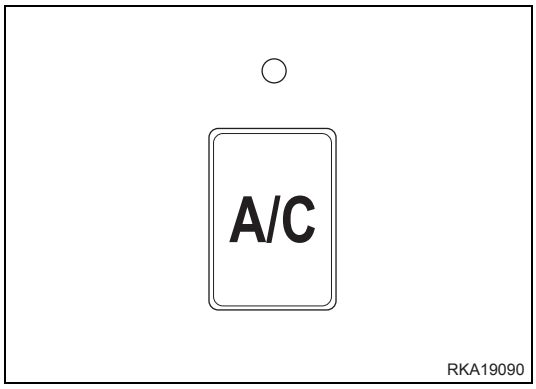
3.2.16.1 AIR CONDITIONER CONTROL PANEL



(1) Air conditioner switch
(2) Temperature control switch
(3) Ventilation selection switches
(4) Air flow selection switches
(5) Air recirculation selection switch
(6) Defrosting lever

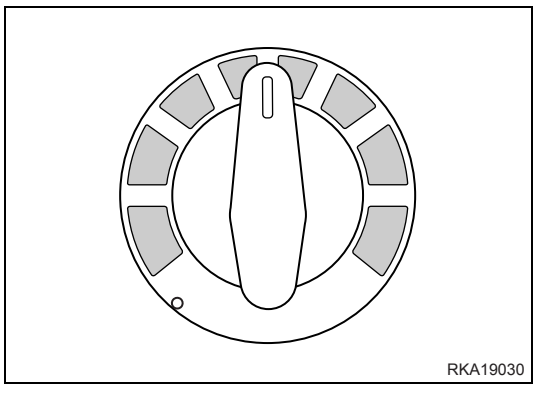
1. Air conditioner switch

This is a two-position (ON-OFF) switch and is used to start and stop the air conditioner.



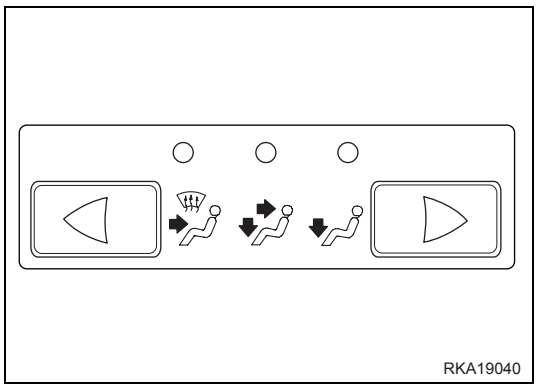
2. Temperature control switch

This is a rotary switch used to start and stop the ventilation system and to control the temperature inside the cab.
The position, ON or OFF, is signalled by a click of the switch when this is turned completely anticlockwise. The temperature can be adjusted by turning the switch. Turning the switch clockwise (red range) increases the temperature, while turning it anticlockwise (light blue range) decreases the temperature.

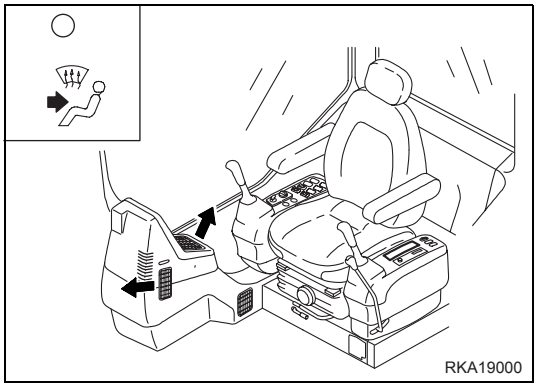


3. Ventilation selection switches

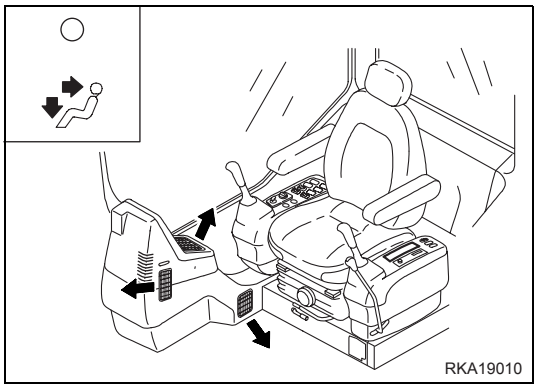
These switches are used to select the direction of the air coming from the heater, and the selection is indicated by a LED.
The LEDs slide progressively and follow the direction of the arrows stamped on the switches. The selected flow is indicated by the coming on of the corresponding LED.
Three directions of the flow can be selected:



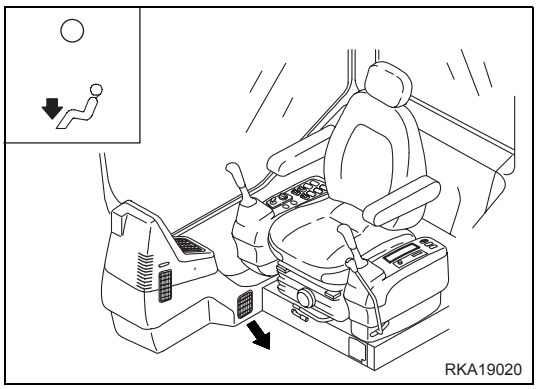
1. Air flow towards the operator’s face.



2. Air flow towards the operator’s face and feet.

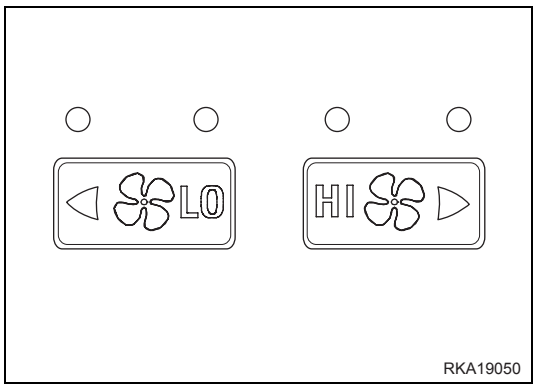


3. Air flow towards the operator’s feet.



4. Air flow selection switches

These switches are used to select the intensity of the air flow coming from the heater and four ventilation levels are available.
The LO (low) switch is used to decrease the air flow, while the HI (high) switch is used to increase the air flow.
The selected flow is indicated by the coming on of the corresponding LED.
The LEDs slide progressively and follow the direction of the arrows stamped on the switches.

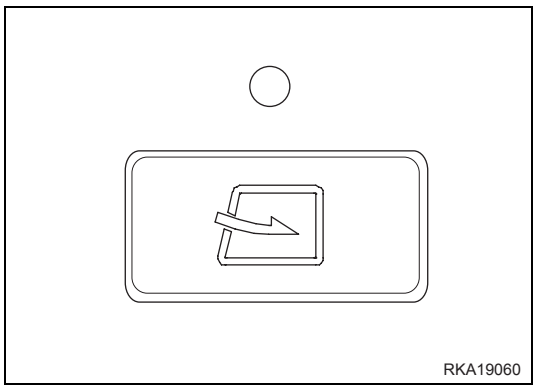


5. Air recirculation selection switch

This is an ON-OFF switch and is used to activate the air recirculation inside the cab, which is useful to cool the cab more quickly and when working in extremely polluted areas.

IMPORTANT

- **Do not use the air recirculation function for long periods in rainy or cold days, since this would increase the fogging of the inside of the windows.**

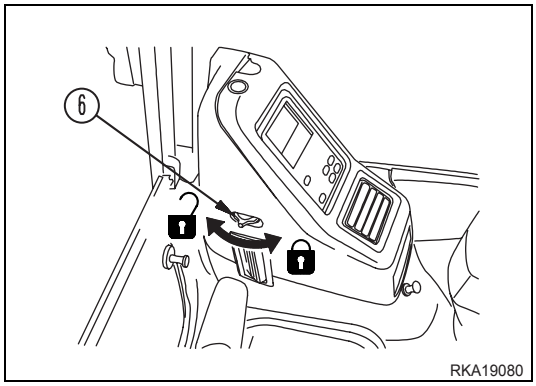


6. Defrosting lever

The lever (6) is used to activate the defrosting function of the front windshield in case of cold or rainy weather.

Lever pushed forward: Defrosting function on.

Lever pulled backward: Defrosting function off.



3.2.17 TECHNICAL DOCUMENTATION COMPARTMENT

On the back of the operator seat there is a compartment for the Use and maintenance manual and other documents.
Always keep the Use and maintenance manual in this compartment, in such a way as to be able to consult it at any moment.

3.2.18 TOOL BOX

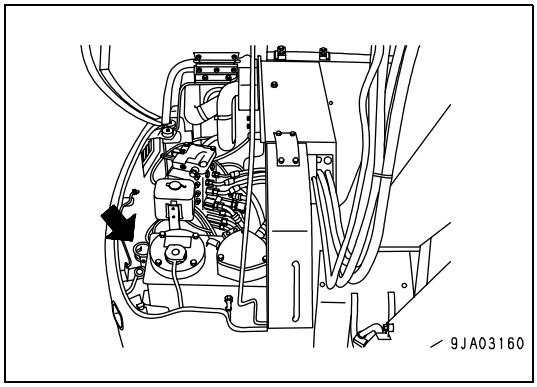
IMPORTANT
- **Keep the cover locked.**
  Open it only if necessary.

Open the cover on the right side of the machine.

Put the tools in this compartment.

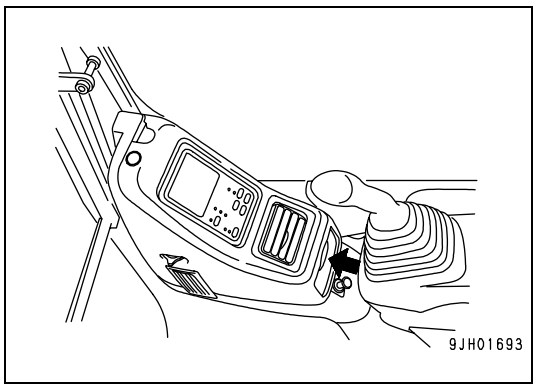
3.2.19 GREASING PUMP SUPPORT

Open the cover on the right side of the machine. The grease pump support is positioned inside the compartment. When the grease pump is not going to be used, insert it in the apposite support.



3.2.20 ASHTRAY

The ashtray is positioned to the right of the operator seat. Be sure to have put your cigarette off completely before closing the cover.

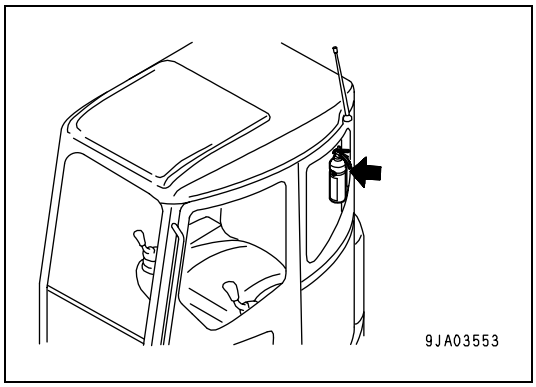


3.2.21 FIRE EXTINGUISHERS

⚠ CAUTION

- **The owner of the machine is responsible for installing and fixing the fire extinguisher where prescribed.**
- **Periodically make sure that the fire extinguisher is full.**

If the operator fears that he may need a fire extinguisher on the machine, he must fix it in the apposite compartment behind the seat.

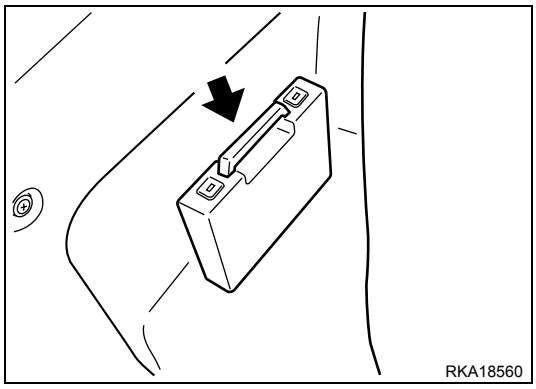


3.2.22 FIRST AID KIT

⚠ CAUTION

- **Periodically make sure that the first aid kit contains the necessary disinfectants, bandages, medicins, etc. and check their condition and expiry date.**

The first aid kit case must be positioned inside the cab, and precisely in the rear storage compartment, by the owner of the machine.



3.3 USE OF THE MACHINE

3.3.1 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

3.3.1.1 VISUAL CHECKS

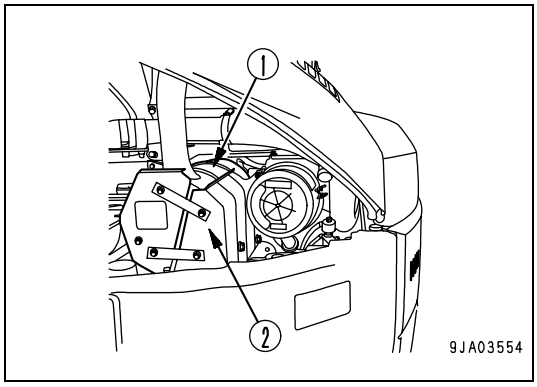
Before starting the engine, look around the machine and under the machine to check for loose nuts or bolts, oil, fuel or coolant leakages, and check the conditions of the work equipment and the hydraulic system. Check also for loose wires, excessive gaps, and accumulation of dust in places that reach high temperatures.

⚠ WARNING

- **When carrying out checks or maintenance operations inside the engine hood or the side cover, make sure that they are completely open and secure them with a suitable retainer.**
- **Immediately remove any flammable materials that may have accumulated around the battery, the exhaust silencer or other hot parts of the engine. Any oil or fuel leakages may set the machine on fire. Check carefully, repair any anomaly or contact your Komatsu Dealer.**

If the machine is inclined, position it horizontally before carrying out the checks.
Carry out the checks and the cleaning operations listed below every day before starting the engine.

1. Check the work equipment, the cylinders, the articulations and the pipes for damage, wear, excessive play. If any anomaly is observed, provide for the necessary repairs.
2. Remove any trace of dirt and dust from the area around the engine, the battery and the radiator.
   Check for accumulated dirt or dust around the engine or the radiator. Check also that there is no flammable material (dry leaves, twigs, grass, etc.) accumulated around the battery or the hot parts of the engine, for example the exhaust silencer. Remove any trace of dirt or flammable material.
   Carefully check for the presence of dust, in particular between the exhaust silencer (1) and the relevant cover (2).



3. Make sure that there are no water or oil leakages around the engine.
   Make sure that there are no oil leakages from the engine or coolant leakages from the cooling system. If any anomaly is observed, provide for the necessary repairs.
4. Make sure that there are no oil leakages from the hydraulic system, the hydraulic tank, pipes, and joints. If any anomaly is observed, provide for the necessary repairs.
5. Check the undercarriage (tracks, sprocket, idler roller, guard) and make sure that there are no damaged parts, signs of wear, loose bolts or oil leakages from the rollers. If any anomaly is observed, provide for the necessary repairs.
6. Check the handrails and the steps for any anomaly. If any anomaly is observed, provide for the necessary repairs. Tighten any loose bolts.
7. Check the indicators and the machine monitor for any anomaly. If any anomaly is observed, provide for the necessary repairs. Remove any trace of dirt from all surfaces.

8. Check if the windows are damaged or if they are out of place. In case of damage or displacement, provide for the necessary repairs. In particular, if a window has broken or gone out of place during work, immediately provide for the necessary repair. Do not attempt to continue work if the necessary repairs have not been carried out.
9. Check and clean the rear-view mirror.
   Check the rear-view mirror for any anomaly and replace it with a new one if it is damaged. Keep the rear-view mirror clean and adjust its inclination so that the rear lower part of the machine (which cannot be seen because of the engine hood) is visible from the operator seat.
10. Seat belt and couplings.
    Make sure that there are no anomalies in the seat belt and its couplings. If they are damaged, replace them with new parts.

3.3.2 DAILY CHECKS

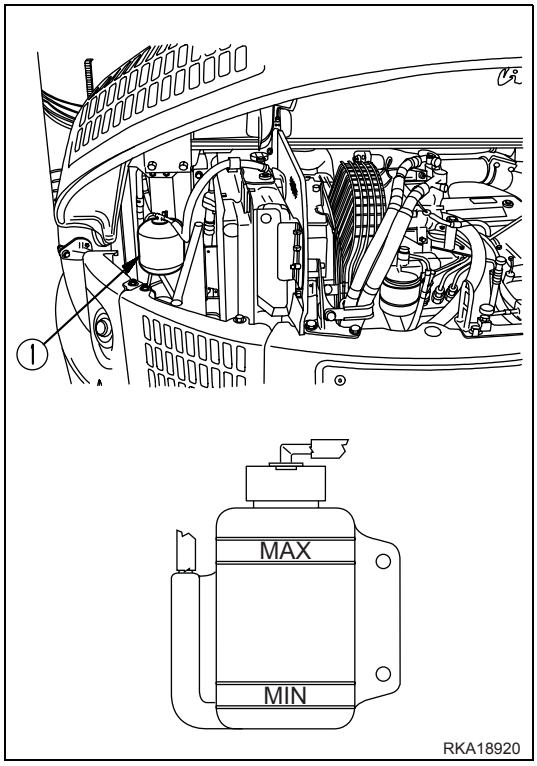
Carry out the checks listed in this section every day before starting the engine.

3.3.2.1 CHECKING THE COOLANT LEVEL AND TOPPING UP

⚠ WARNING

- **Do not open the radiator cap, unless such operation is absolutely necessary. Before checking the coolant level, wait for the engine to cool down. Carry out this check using the expansion tank.**
- **Immediately after the engine has stopped, the coolant is very hot and the pressure in the radiator is very high. Removing the radiator cap in these conditions to check the coolant level may pose a burn hazard. Wait for the temperature to lower, then turn the cap slowly to release the pressure before removing it completely.**

1. Open the engine hood and make sure that the coolant level is included between the MIN. and MAX. marks on the expansion tank of the radiator (1) (figure on the right). If the level is low, top up through the filler neck until reaching the MAX. mark.
2. Put back the cap after topping up.
3. If the expansion tank is empty, there may be a coolant leakage. After checking, immediately provide for the necessary repairs. If there is no anomaly, check the coolant level in the radiator. If the level is low, add coolant in the radiator and then in the expansion tank (1).



3.3.2.2 CHECKING THE ENGINE OIL LEVEL AND TOPPING UP

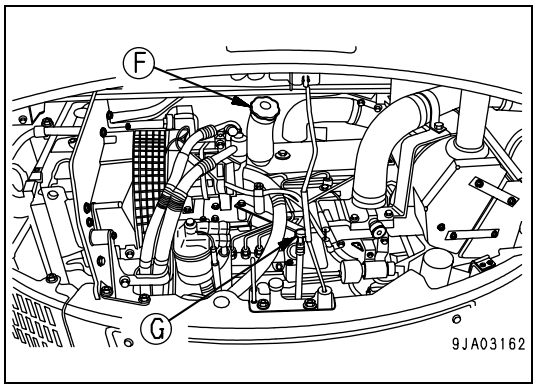
⚠ WARNING

- **Soon after the machine has been stopped the engine is very hot and may cause burns; let the engine cool down to 40-45°C before carrying out any check.**

⚠ CAUTION

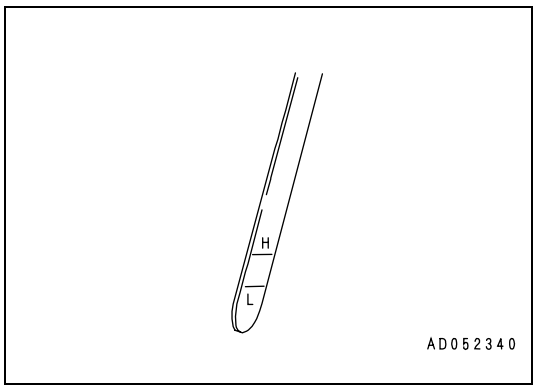
- **When carrying out an inspection or maintenance operation inside the engine hood, always open it completely and make sure that it is kept open by the apposite rod.**

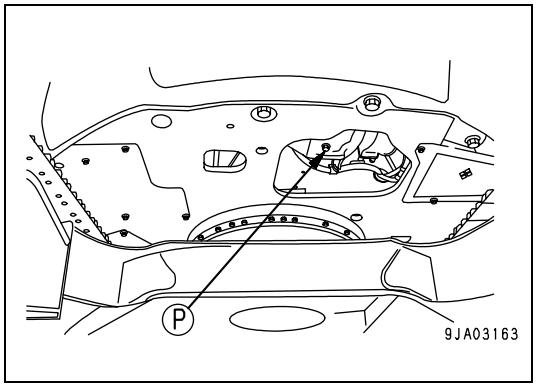
1. Open the engine hood.
2. Remove the dipstick (G) and wipe it with a cloth.
3. Insert the dipstick (G) completely into the oil filling pipe, then extract it.
4. The oil level must be included between the H and L marks on the dipstick (G).
   If the oil level is below the L mark, top up through the filler neck (F).
5. If the oil level is above the H mark, drain the excess oil through the drain plug (P), and check the oil level again.
6. If the oil level is correct, tighten the oil filler, then close the engine hood.



NOTE

- If the machine is inclined, position it horizontally before carrying out the check.
  If it is necessary to check the oil level when the engine has just been stopped, wait approximately 15 minutes before carrying out this operation.



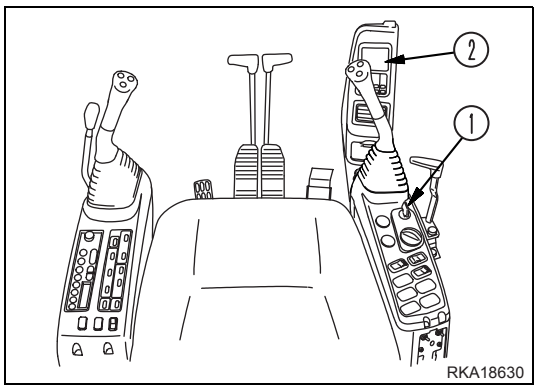


3.3.2.3 CHECKING THE FUEL LEVEL AND REFUELLING

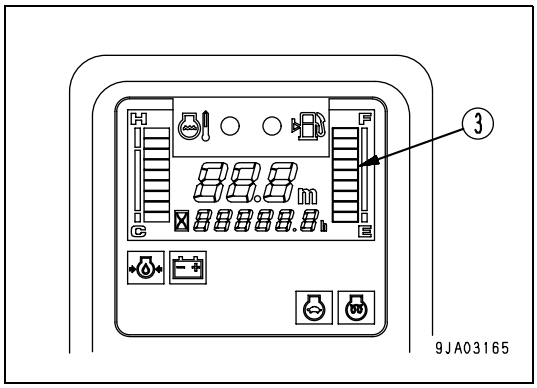
⚠ WARNING

- **When refuelling, avoid spilling fuel, since this may cause a fire hazard. If fuel is spilled, wipe it up immediately.**
- **Fuel is highly flammable; do not use naked flames and do not smoke when refuelling. Hold the fuel gun constantly in contact with the filler.**

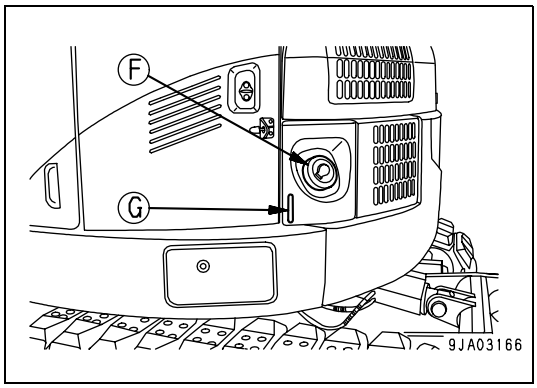
1- Insert the key in the ignition switch (1) and turn in to position ON, so that the machine monitor (2) lights up.



2. Check the fuel indicator (3) to verify the quantity of fuel still available in the tank.



3. If necessary, refuel through the filler neck (F), checking the sight gauge (G).
   Fuel tank capacity: 125 l.
4. After refuelling, tighten the fuel cap.



IMPORTANT

- **It is advisable to refuel after work, in order to avoid the formation of water condensate.**

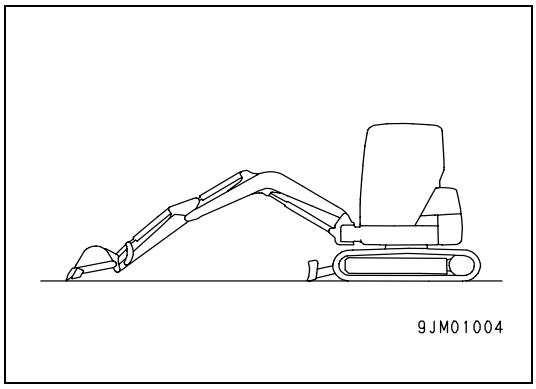
3.3.2.4 CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP

⚠ WARNING

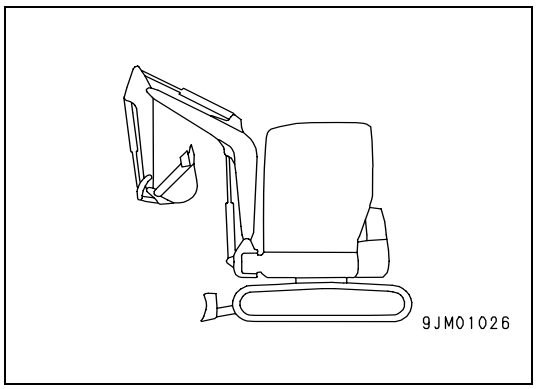
- **Carry out this check when the oil is cold, with the machine positioned on level ground, bucket and arm cylinders retracted and bucket teeth resting on the ground.**
- **Before topping up, stop the engine and eliminate the residual pressure from the equipment circuits (by shifting the controls more than once) and from the tank by slowly loosening the filling cap.**

Check the oil level in the hydraulic tank, with the machine in the conditions A or B illustrated below.

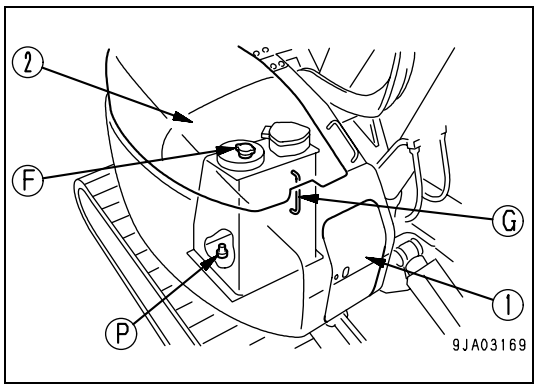
A) Start the engine and let it idle; lower the blade to the ground, retract the arm and bucket cylinders completely, swing the boom to the centre.
Lower the boom until the bucket teeth touch the ground and then stop the engine.



Start the engine and let it idle; lower the blade to the ground, extend the arm and bucket cylinders completely, swing the boom to the centre.
Lift the boom completely and stop the engine.



2. Open the battery inspection cover (1) and check the oil level through the sight gauge (G). If the level is as indicated below, it is correct.



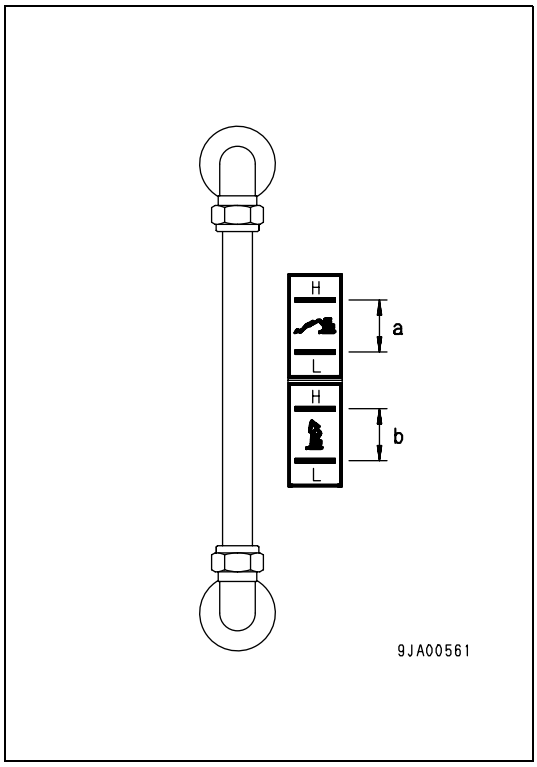
Machine in position A: included in the range “a”

Machine in position B: included in the range “b”

IMPORTANT

- **Do not add oil above the H mark, in order to avoid damaging the hydraulic circuit or causing oil leakages.**
- **If the H mark has been exceeded, turn the turret so as to position the drain plug (P), which is under the hydraulic tank, between the tracks, then stop the engine and wait for the hydraulic oil to cool down. At this point, drain the excess oil through the drain plug (P).**

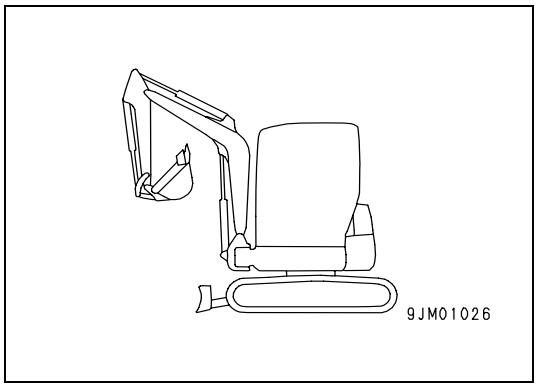
3. If the oil level is below the L mark, open the side cover and top up through the filler neck (F).



NOTE

- The oil level varies according to its temperature. Consequently, it is advisable to keep to the instructions given below:
- Before operation: around level L
  Oil temperature: from 10 to 30° C)
- Normal operation: near level H
  (Oil temperature ranging: from 50 to 80° C)

4. When topping up the hydraulic tank with the machine in position A, extend the boom, arm and bucket cylinders completely, as shown in the diagram on the right, then tighten the oil cap again and pressurize the hydraulic tank.

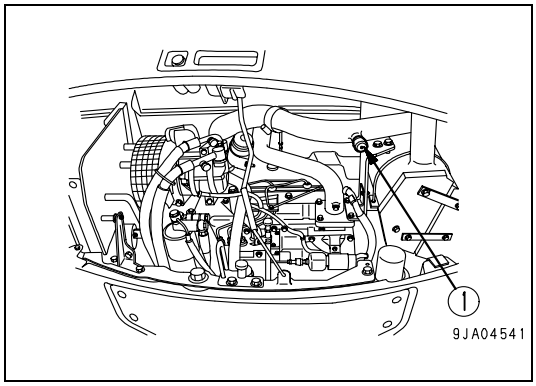


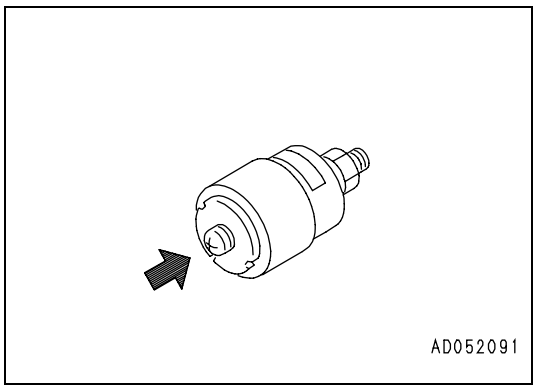
IMPORTANT

- **Make sure that the hydraulic tank is pressurized. If the tank isn’t under pressure, the pump will suck in air and this will damage the equipment.**

3.3.2.5 CHECKING THE AIR FILTER CLOGGING INDICATOR

1. Open the engine hood and make sure that the red piston is not visible in the indicator (1).
2. If the red piston is visible, clean or replace the filtering element immediately.
   For further details on how to clean the filtering element, see "4.9.1.a CHECKING, CLEANING OR CHANGING THE AIR FILTER CARTRIDGE".
3. After the check, cleaning operation or change, press the button on the indicator (1) to move the red piston back to its original position.





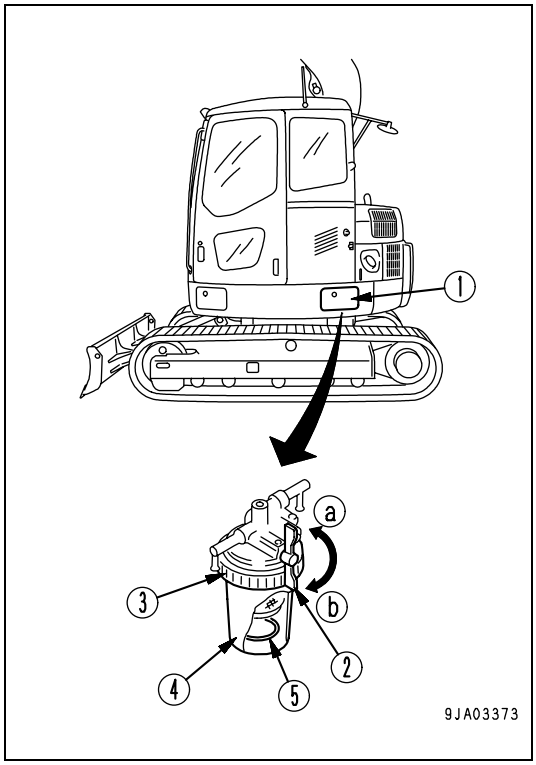
3.3.2.6 CHECKING THE WATER SEPARATOR

⚠ WARNING

- **Fuel is flammable; do not use naked flames and do not smoke while draining the water separator.**
- **If fuel is spilled, wipe it up immediately.**

If the red ring (5) of the water separator is on the bottom of the cup (4), this means that there is no water.
If the red ring (5) floats, this means that there is water under the ring, so drain the water by proceeding as indicated below.

1. Open the inspection cover (1) on the left side of the machine and turn the knob (2) of the filter to position CLOSED (a).
2. Using the filter wrench, loosen the ring (3), then remove the cup (4) and throw out the water that is inside it.
3. Fill the cup (4) with fuel, install it on the filter housing, then tighten the ring (3).
4. Turn the knob (2) to position OPEN (b).
5. Drain any water or sediment from the fuel tank. For further details, see "4.9.4.a DRAINING THE FUEL TANK".



3.3.2.7 CHECK THE WIRING SYSTEMS

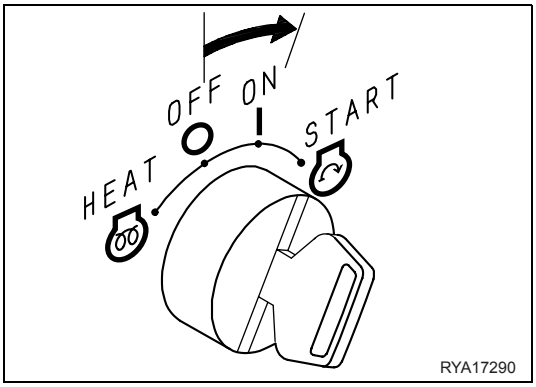
⚠ WARNING

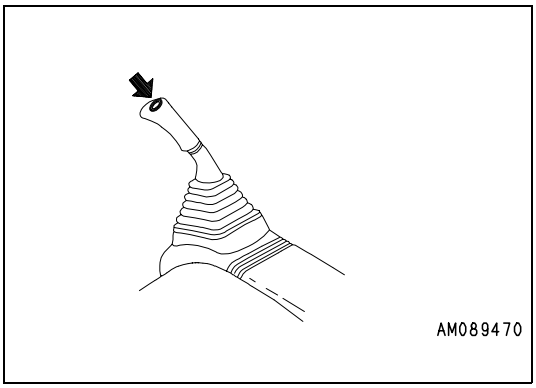
- **If the fuses are corroded, oxidized or not perfectly held in their seat, replace them only with fuses having the same capacity; before changing a fuse, make sure that the ignition key is in position OFF.**
- **If the wirings show traces of short circuits, contact your Komatsu Dealer, who will locate the fault and carry out any necessary repairs.**
- **Before checking the wiring, take all the necessary safety precautions.**
- **Always keep the battery surface clean and make sure that the charge level warning light is always visible.**

Make sure that the fuses are not damaged, that fuses with the specified capacity are used, that there are no interruptions or short circuits in the wiring or damaged covers. Also make sure that there are no loose terminals and tighten them if necessary.
Carefully check the cables of the battery, the starter and the alternator.
Always check for flammable material around the battery and remove it if necessary.

3.3.2.8 CHECKING THE HORN

1. Turn the ignition switch to position ON.
2. Press the button positioned on the right lever and make sure that the horn functions correctly.
   If the horn does not sound, contact your Komatsu Dealer, who will carry out the necessary repairs.



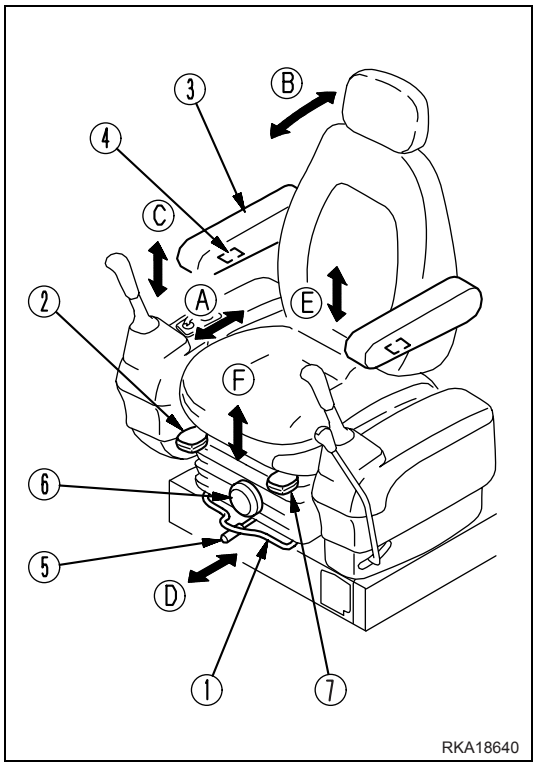


3.3.3 ADJUSTMENTS

⚠ WARNING

- **Adjust the position of the seat before starting work or when taking the place of another operator.**
- **Adjust the seat so that the control levers and the switches can be easily used by the operator seated with his back against the backrest.**

3.3.3.1 ADJUSTING THE SEAT



(A) Longitudinal adjustment

Shift the lever (1) upwards, move the operator seat to the desired position, then release the lever.
Longitudinal adjustment: 50 mm

(B) Backrest inclination

NOTE

- The backrest can be tilted to a greater degree by pushing the seat forward. The possible degree of inclination of the backrest is reduced if the seat is moved backward; to be able to push the seat backward, set the backrest in vertical position.

Pull the lever (2) and set the backrest so that it is comfortable for the operator, then release the lever.
During the adjustment operations, remain seated with the back against the backrest. If the operator's back is not against the backrest, this may move suddenly forward.

(C) Armrest inclination

The armrest (3) can be lifted manually by rotating it by approx. 90°.
Furthermore, it is possible to adjust the vertical angle of the armrest with precision by rotating the control (4) at the end of the armrest manually.
Armrest adjusting angle: 25°.

IMPORTANT

- **If the backrest is inclined forward without lifting the armrest (3), this will be automatically lifted.**

(D) Longitudinal adjustment of the whole seat unit

Shift the lever (5) to the right. After positioning the seat as desired, release the lever (5). In this way, the operator seat, the right and left control levers and the safety lever slide all together.
Longitudinal adjustment: 100 mm

(E) Suspension

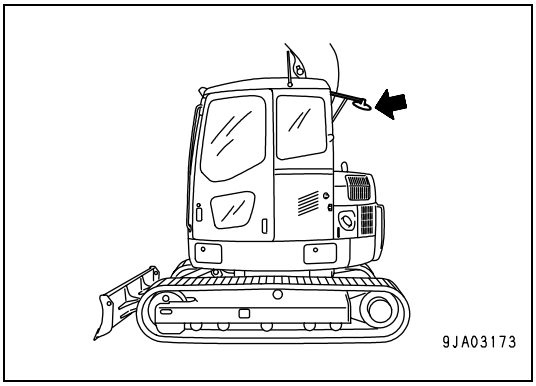
Set the weight adjustment control according to your own weight, turning the knob (6) that is under the operator seat.
The weight can be adjusted between 50 and 120 kg.
To obtain a softer suspension, set a lower weight; to obtain a more rigid suspension, set a higher weight. When working on uneven surfaces, adjust the seat to a harder setting.

(F) Cushion

Pull the lever (7) and adjust the cushion so that it is comfortable for the operator, then release the lever. Four positions can be selected.

3.3.3.2 REAR-VIEW MIRRORS

Adjust the inclination of the rear-view mirrors so that the rear lower part of the machine (which cannot be seen because of the engine hood) is well visible.



3.3.4 SEAT BELT

⚠ WARNING

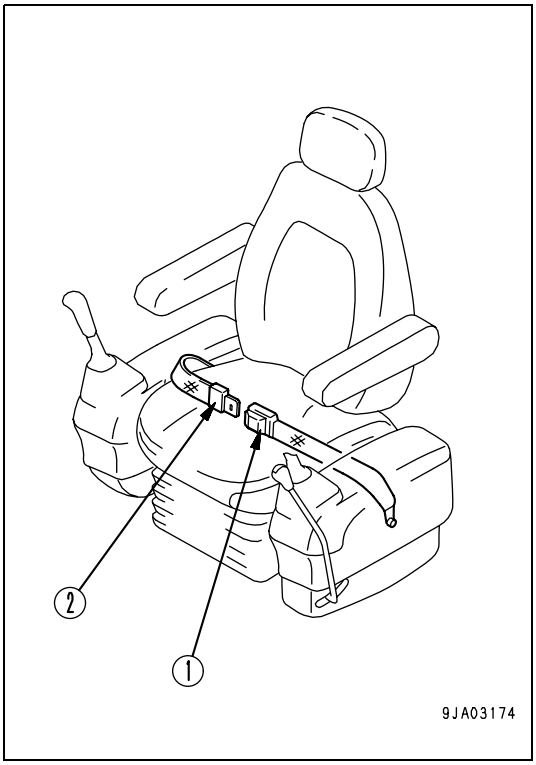
- **Before fastening the seat belt, make sure that the fastening brackets or the belt itself do not show any anomaly. If there are damaged or worn parts, change the belt.**
- **The seat belt must be changed every 3 years, even if there are no anomalies or signs of wear. The date of manufacture is indicated on the reverse side of the belt.**
- **Adjust and fasten the seat belt before operating the machine.**
- **Always fasten the seat belt when working with the machine.**
- **Make sure that none of the two parts of the belt is twisted.**

Make sure that the bolts of the retainer that fastens the seat belt to the frame are not loose and if necessary tighten them at the torque of 24,5 ± 4,9 Nm (2,5 ± 0,5 kgfm).
Change the belt unit if the surface of the belt is damaged, or if the couplings are broken or deformed.

3.3.4.1 FASTENING AND UNFASTENING THE SEAT BELT

1. Adjust the seat in such a way as to ensure that there is sufficient knee room when pressing the pedal thoroughly while seated, with the back resting against the backrest.
2. After adjusting the position, seat down. Take the buckle (1) and the tang (2) and insert the tang (2) in the buckle (1). Pull the belt to make sure that the tang is securely inserted and locked in the buckle.
3. To unfasten the seat belt, press the red button on the buckle (1).

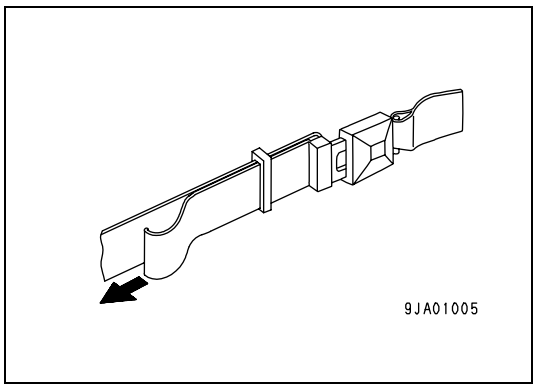
Fasten the belt without twisting it. Adjust the length of the belt on the tang side.



3.3.4.2 ADJUSTING THE SEAT BELT

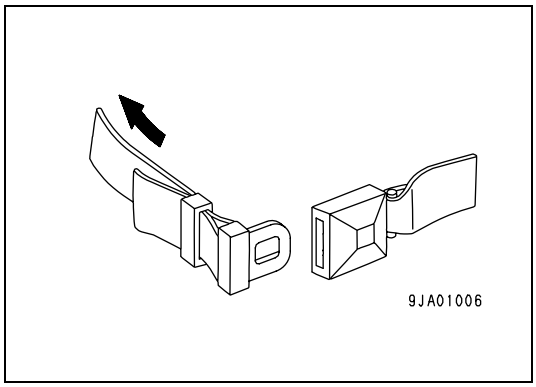
How to shorten the belt

Pull the free end of the belt on the tang side.



How to lengthen the belt

Pull the part of the belt including the tang perpendicularly to the tang itself.



3.3.4.3 RETRACTABLE SEAT BELT (if provided)

⚠ WARNING

- **Before fastening the seat belt, make sure that the fastening brackets or the belt itself do not show any anomaly. If there are damaged or worn parts, change the belt.**
- **The seat belt must be changed every 3 years, even if there are no anomalies or signs of wear. The date of manufacture is indicated on the reverse side of the belt.**
- **Always fasten the seat belt when working with the machine.**
- **Fasten the seat belt taking care not to twist it.**

Fastening and unfastening the seat belt

This belt is provided with a retractor, therefore it is not necessary to adjust its length.

Fastening the seat belt

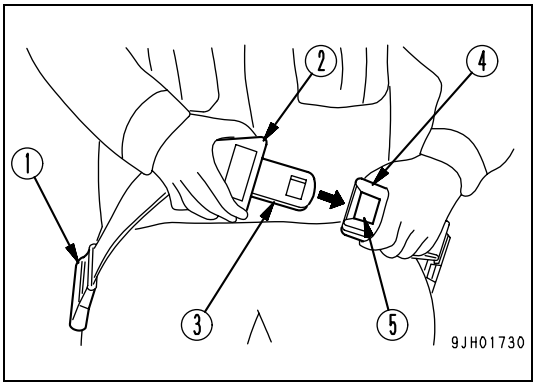
Seize the grip (2) and extract the belt from the retractor (1), make sure that the belt is not twisted, then insert the tang (3) in the buckle (4).

After completing this operation, pull the belt slightly to make sure that it is correctly locked.

Unfastening the seat belt

Press the button (5) on the buckle (4) and remove the tang (3) from the buckle (4).

The belt is automatically retracted; at this point seize the grip (2) and slowly help the belt manually into the retractor (1).



3.3.5 OPERATIONAL CHECKS

⚠ WARNING

- **When starting the engine, make sure that the safety lever is in the “locked” position.**
- **If the control levers are not locked and are inadvertently touched when the engine is started, the work equipment may move suddenly and cause serious accidents.**

1. Make sure that the safety lever is in position “lock”.

NOTE
- The engine cannot be started if the safety lever is not in position “lock”.

2. Make sure that all control levers are in neutral.
3. Insert the key in the ignition switch (2), turn the key to position ON, then carry out the following checks.

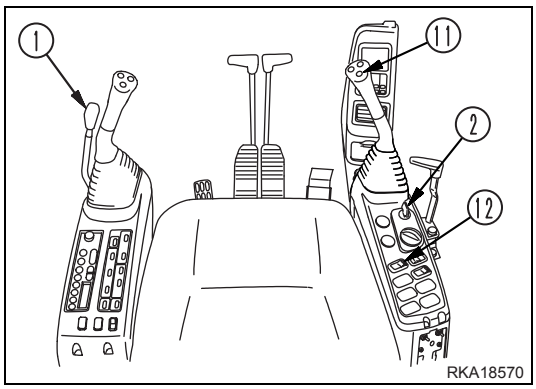
   1) The acoustic alarm sounds for approximately 1 second, then the warning lights and indicators listed below come on for approximately 3 seconds.

   - Battery charge level warning light (3)
   - Engine oil pressure warning light (4)
   - Engine coolant temperature indicator (5)
   - Engine coolant temperature warning light (6)
   - Fuel level warning light (7)
   - Fuel gauge (8):
   - Quick deceleration warning light (9)
   - Pre-heating warning light (10)

   If a warning light or indicator does not light up or the acoustic alarm does not sound, there is probably a burnt bulb or a disconnected element, so contact your Komatsu Dealer for the necessary repairs.

   After approximately 3 seconds, the warning lights and indicators listed below will remain on, while the others will go out.

   - Battery charge level warning light (3)
   - Engine oil pressure warning light (4)
   - Engine coolant temperature indicator (5)
   - Fuel level warning light (8)



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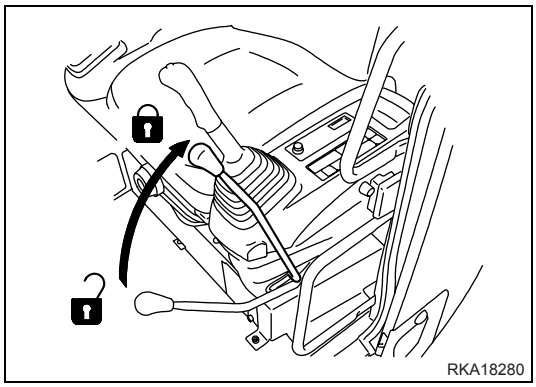
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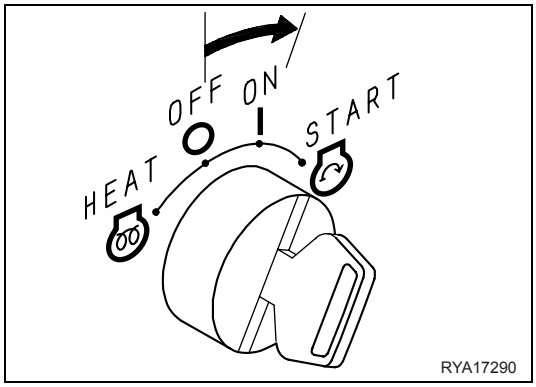

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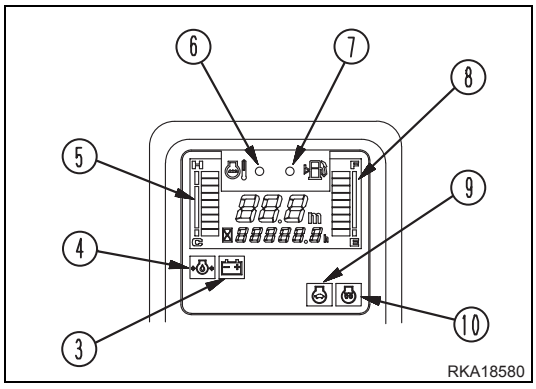

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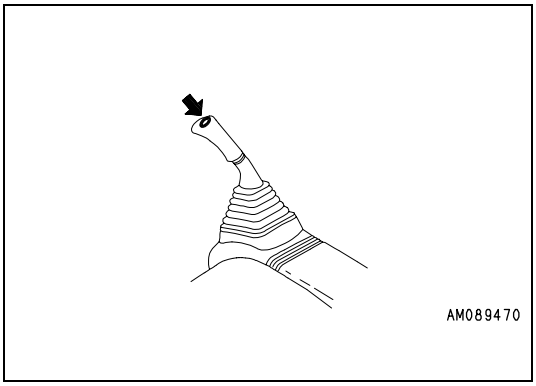
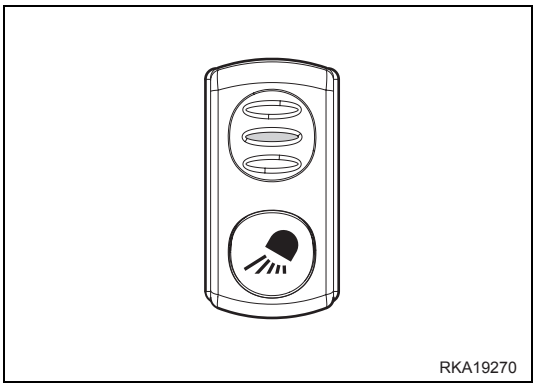
2) Press the horn button (11) to make sure that the horn functions correctly.



3)Press the light switch (12) to switch on the work lights. If they do not light up, there is probably a burnt bulb or a disconnected element, so contact your Komatsu Dealer for the necessary repairs.



3.3.6 STARTING THE ENGINE

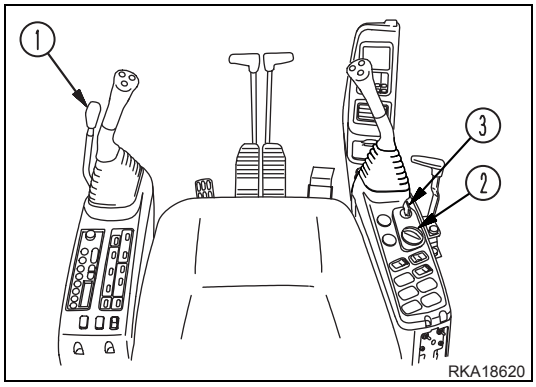
3.3.6.1 STARTING THE ENGINE IN NORMAL OPERATING CONDITIONS

⚠ WARNING

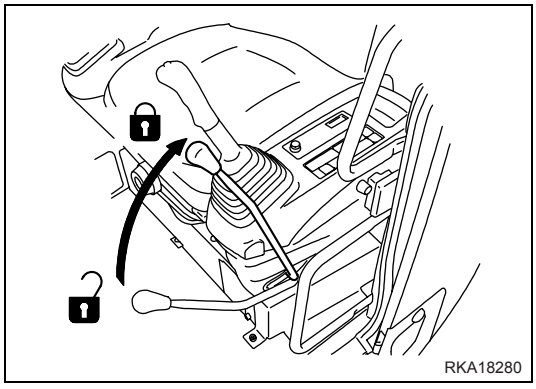
- **Before starting the engine, carefully read the instructions and information regarding safety contained in this manual and make sure that you know the controls. From the moment at which the engine is started, the operator is directly responsible for any damage that may be caused by wrong manoeuvres and non-compliance with the safety regulations and the rule of the road..**
- **Do not attempt to start the engine by causing a short-circuit with the terminals of the starter. This may cause serious injury or even fires.**
- **Start the engine only while seated with fastened seat belt.**
- **Before starting the engine, make sure that there is no one within the operating range of the machine and sound the horn.**
- **Exhaust gas is toxic. When starting the engine in closed places, make sure that there is sufficient ventilation.**

IMPORTANT

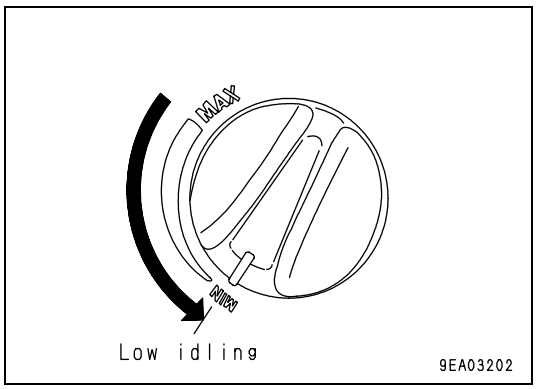
- **Do not attempt to start the engine with the hand accelerator set at the maximum rpm, in order to avoid damaging the engine components.**
- **Do not make the starter run for more than 20 seconds without interruption. If the engine does not start, wait at least 2 minutes before trying again.**



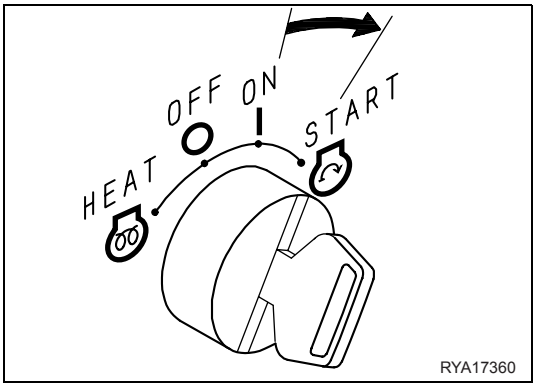
1. Make sure that the safety lever (1) is in the “locked” position (L). If the lever has been released, it is not possible to start the engine.



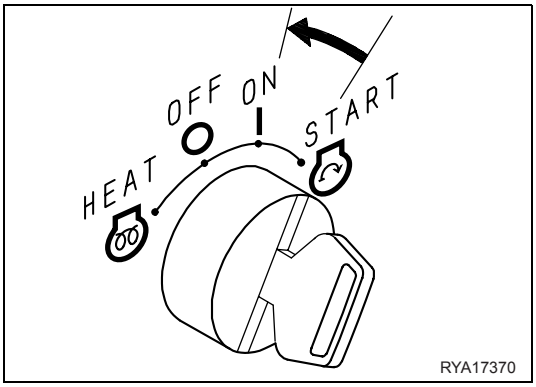
2. Shift the hand accelerator (2) to the idling position.



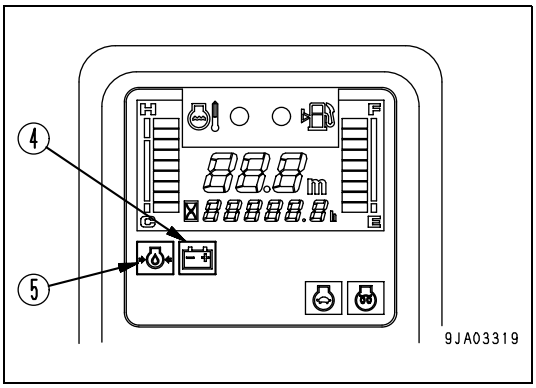
3. Turn the ignition key (3) to position START to start the engine.



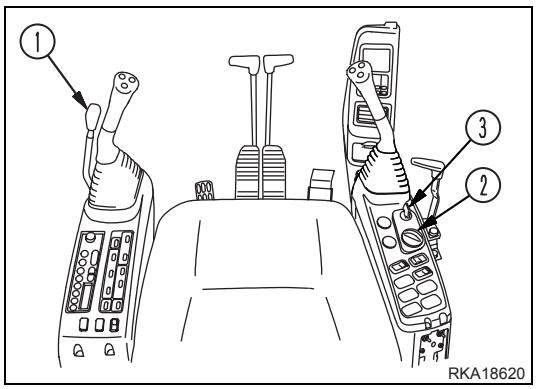
4. As soon as the engine starts, release the key (3), which will automatically return to position ON.



5. Let the engine idle for the first 15 seconds soon after starting the engine and do not operate any control lever or the hand accelerator.
6. Make sure that the charge level warning light (4) and the engine oil pressure warning light (5) do not light up.

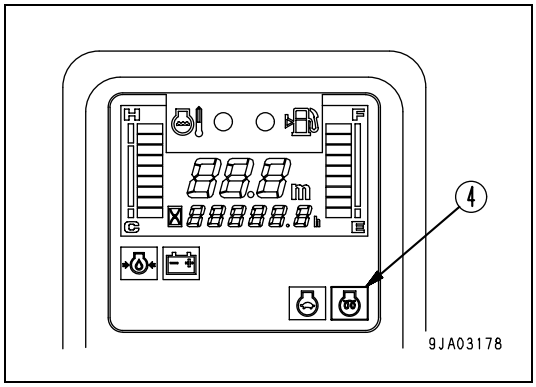


3.3.6.2 STARTING WITH COLD ENGINE OR IN COLD CLIMATES



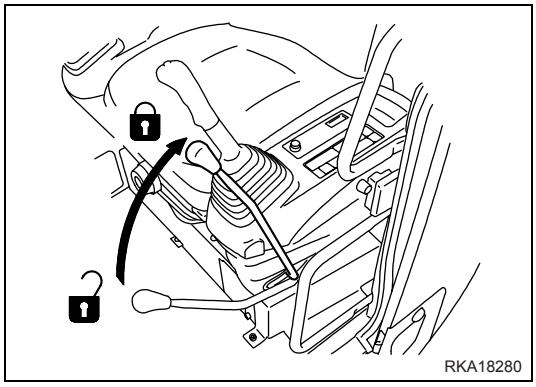
⚠ WARNING

- **Before starting the engine, carefully read the instructions and information regarding safety contained in this manual and make sure that you know the controls. From the moment at which the engine is started, the operator is directly responsible for any damage that may be caused by wrong manoeuvres and non-compliance with the safety regulations and the rule of the road..**
- **Do not attempt to start the engine by causing a short-circuit with the terminals of the starter. This may cause serious injury or even fires.**
- **Start the engine only while seated with fastened seat belt.**
- **Before starting the engine, make sure that there is no one within the operating range of the machine and sound the horn.**
- **Never use starting aid fluids or products, as they may cause explosions.**
- **Exhaust gas is toxic. When starting the engine in closed places, make sure that there is sufficient ventilation.**



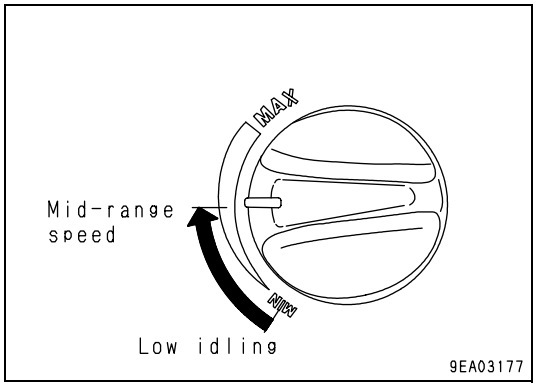
IMPORTANT

- **Do not attempt to start the engine with the hand accelerator set at the maximum rpm, in order to avoid damaging the engine components.**
- **Do not make the starter run for more than 20 seconds without interruption. If the engine does not start, wait at least 2 minutes before trying again.**



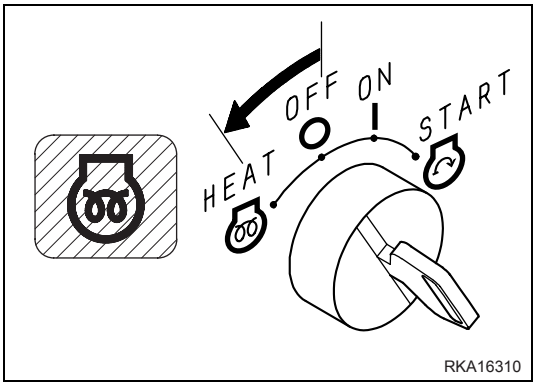
When starting the engine in cold climates, proceed as indicated below.

1. Make sure that the safety lever (1) is in the “locked” position. If the lever has been released, it is not possible to start the engine.
2. Before starting the engine, make sure that the hand accelerator (2) is in idling position.
3. Turn the hand accelerator (2) to a central position, between MIN. and MAX.

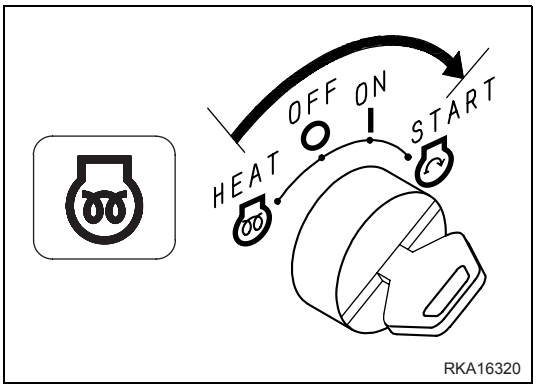


4. Keep the key in the ignition switch (3) in preheating position (HEAT) and make sure that the preheating warning light (4) comes on.
   After approximately 30 seconds, the preheating warning light (4) starts blinking and goes on for 10 seconds, indicating that the preheating phase has been completed.

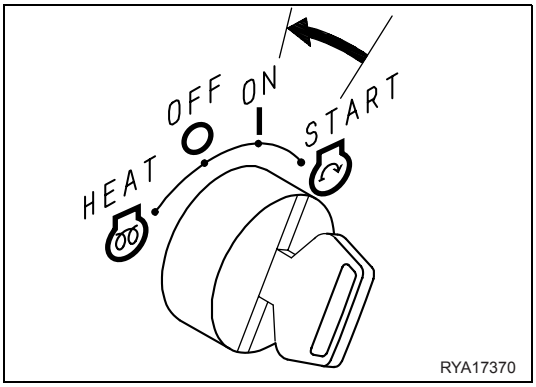
NOTE
- The warning light and the indicator come on even when the key is in preheating position (HEAT), but this does not indicate any anomaly.



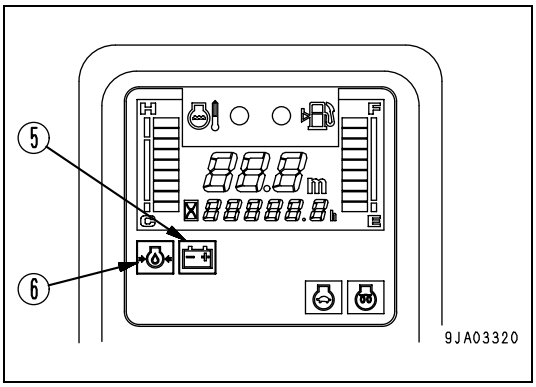
5. When the preheating warning light (4) goes out, turn the ignition key (3) to position START to start the engine.



6. As soon as the engine starts, release the key (3), which will automatically return to position ON.



7. Let the engine idle for the first 15 seconds soon after starting the engine and during this lapse of time do not operate any control lever or the hand accelerator.
8. Make sure that the charge level warning light (5) and the engine oil pressure warning light (6) go out.



3.3.7 AFTER STARTING THE ENGINE

⚠ WARNING

- **Emergency stop if there is any anomaly or malfunction, turn the ignition switch to position OFF.**
- **If the work equipment is operated without warming up the engine sufficiently, the response of the work equipment to the movements of the control levers will be slow and in some cases the work equipment will not behave as desired by the operator, so always carry out the warming up procedure, in particular when working in cold areas or climates.**

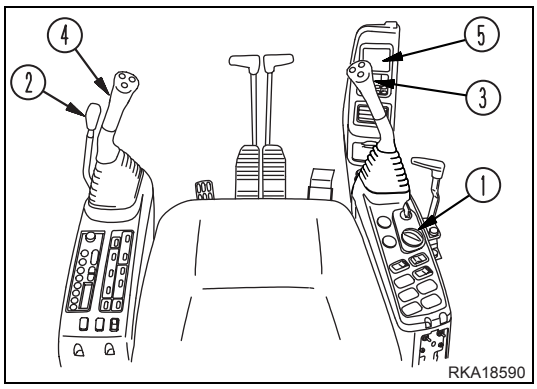
3.3.7.1 RUNNING-IN

⚠ CAUTION

- **Komatsu machines are adjusted and tested completely before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance of the machine and shorten its life.**
  The running-in stage should last for the first 100 hours of operation (as indicated by the hour meter).
  During running-in,follow the instructions given in this manual.

- After starting the engine, let it idle for 5 minutes.
- Avoid using the machine with excessive loads and avoid high speeds.
- Immediately after starting the engine, avoid sudden starts, sudden accelerations, unnecessary sudden stops, and sudden changes in direction.

3.3.7.2 WARMING-UP PROCEDURE

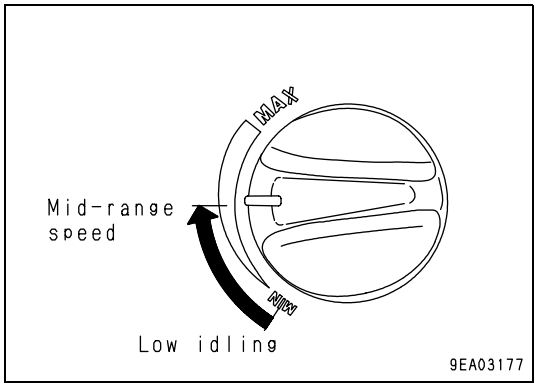


IMPORTANT

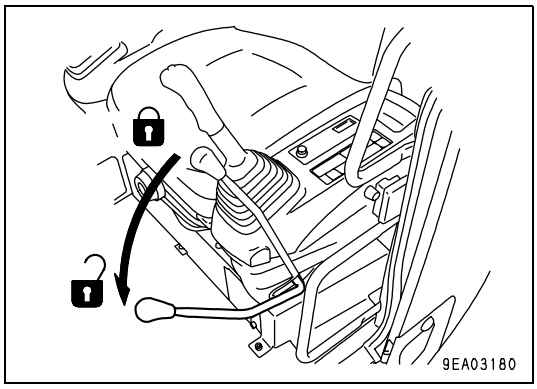
- **Do not carry out any operation and do not shift the levers suddenly when the hydraulic oil temperature is too low. The warming-up procedure should be always carried out, since it certainly ensures longer machine life.**
- **Do not accelerate abruptly before completing the warming-up operations.**
  Do not let the engine run at idling or maximum speed for more than 20 minutes without interruption. If it is necessary to let the engine idle, accelerate every now and then or increase the speed up to an intermediate value.

After starting the engine, do not start working immediately. Carry out the operations and checks indicated below.

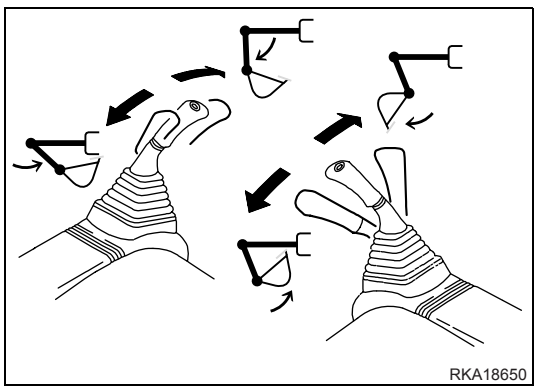
1. Turn the hand accelerator (1) to a central position, between MIN. and MAX. and let the engine run at medium speed for approximately 5 minutes, without load.



2. Release the safety lever (2) and lift the bucket from the ground.



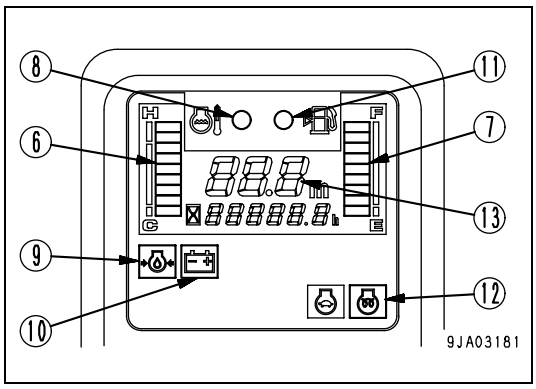
3. Slowly operate the bucket control lever (3) and the arm control lever (4), in such a way as to make the bucket and arm cylinders reach the end of stroke.
4. Operate the bucket for 30 seconds and the arm for another 30 seconds alternately, for a total time of 5 minutes.



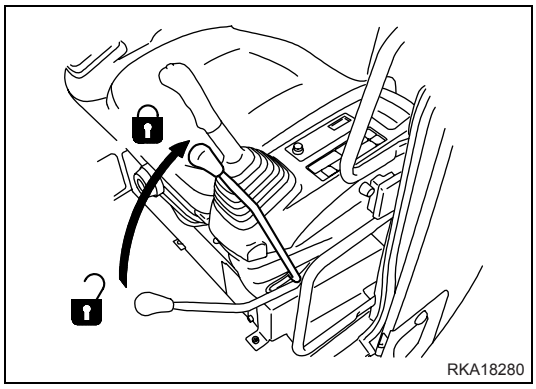
IMPORTANT

- **When the work equipment is folded, be careful to prevent it from interfering with the machine body or touching the ground.**

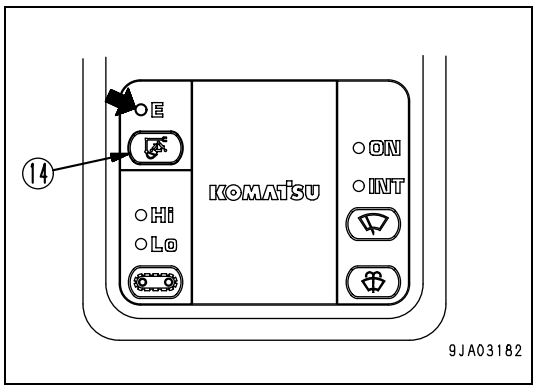
5. After completing the warming-up procedure, make sure that the warning lights (5) are in the conditions indicated below.
   - Engine coolant temperature indicator (6): within the green range
   - Fuel gauge (7): within the green range
   - Engine coolant temperature warning light (8): OFF
   - Engine oil pressure warning light (9): OFF
   - Battery charge level warning light (10): OFF
   - Fuel level warning light (11) OFF
   - Pre-heating warning light (12) OFF
   - Display (13): OFF



6. Check the colour of the exhaust gas and verify if there are noises or vibrations. If any anomaly is observed, contact your Komatsu Dealer.
7. Shift the safety lever (2) to position “lock” and make sure that the controls levers, the work equipment, the blade, the swing and travel functions cannot be operated.



8. Set the work mode selection switch (14) positioned on the warning lights panel (5) to the current work mode.
   When the warning light (E) comes on: E mode (when fuel saving is desired)
   When the warning light (E) does not come on: Active mode (for heavy-duty applications).

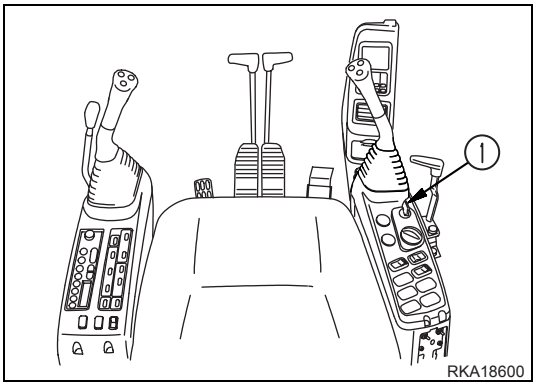


3.3.8 STOPPING THE ENGINE

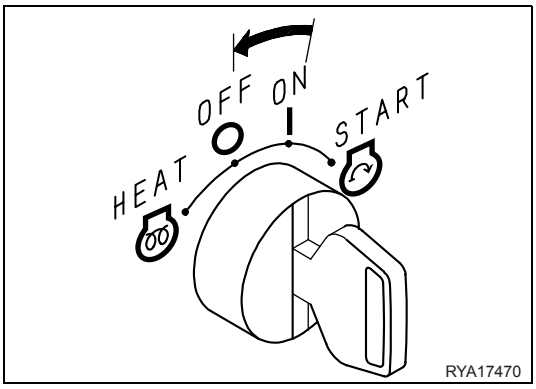
IMPORTANT

- **The sudden stop of the engine while it is running shortens its life.**
- **Do not stop the engine suddenly, except in case of emergency. It is likewise recommended not to stop the engine suddenly if it has been running for a long period and is still hot; in this case, let the engine run at low idling speed for about 5 minutes, in order to allow it to cool down gradually before stopping it.**

1. Run the engine at low idling speed for about 5 minutes, in order to allow it to cool down gradually.



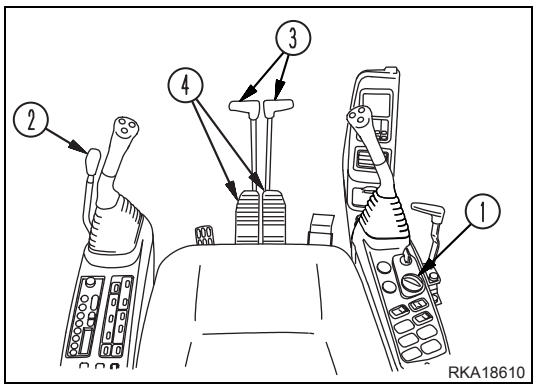
2. Turn the ignition key (1) to position OFF to stop the engine.
3. Remove the key (1).



3.3.9 CHECKS TO BE CARRIED OUT AFTER STOPPING THE ENGINE

1. Carry out a visual check of the work equipment and the undercarriage from the outside, verifying also if there are oil or water leakages. If any anomaly is observed, provide for the necessary repairs.
2. Check the inside of the engine compartment for paper or debris. Remove any trace of paper or debris to avoid a fire hazard.
3. Remove the mud that is attached to the undercarriage.

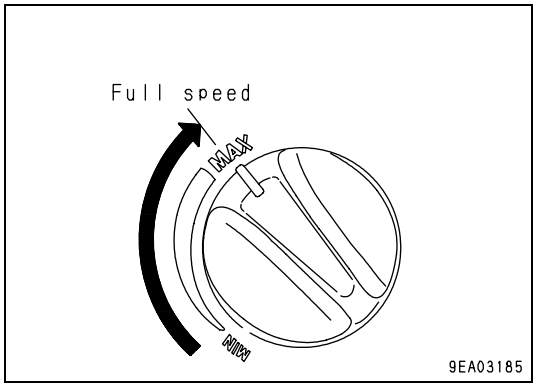
3.3.10 OPERATING THE MACHINE



⚠ WARNING

- **Before moving the machine, make sure that you perfectly know the control functions and all the relevant safety regulations.**
- **The operator must be seated in the driving position with fastened seat belt.**
- **Before operating the travel levers, check the direction of the undercarriage. If the sprocket is at the front, the operation of the travel levers is inverted.**
- **Before moving the machine, make sure that there is no one within its operating range and that there are no obstacles in the surrounding area.**
- **Be extremely careful when reversing, and make sure that there are no persons, other equipment or obstacles in the way.**
- **Avoid any travel manoeuvre or change of direction with the accelerator at maximum speed, since manoeuvres carried out in these conditions may cause abrupt and dangerous movements.**
- **Do not use the speed increase function when changing direction or carrying out a counter-rotation.**
- **Make sure that the travel alarm functions correctly.**

3.3.10.1 HOW TO MOVE THE MACHINE



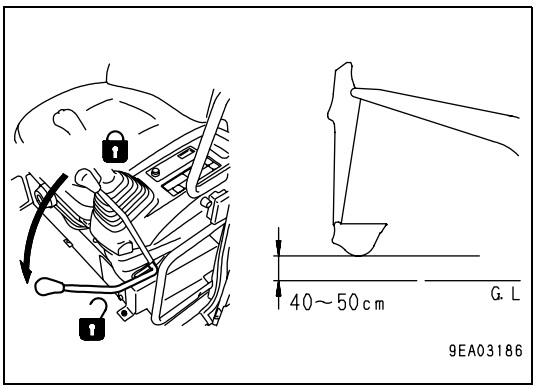
1. Turn the hand accelerator (1) towards position MAX. to increase the engine speed.

NOTE

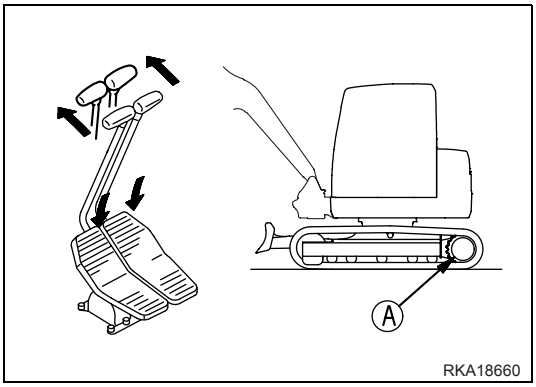
- If the engine speed cannot be increased, the quick deceleration switch may be in position ON. Check the corresponding warning light. For further details on the operation of the quick deceleration switch, see"3.2.2 pos. 3. Quick deceleration switch".

3.3.10.2 MOVING THE MACHINE FORWARD

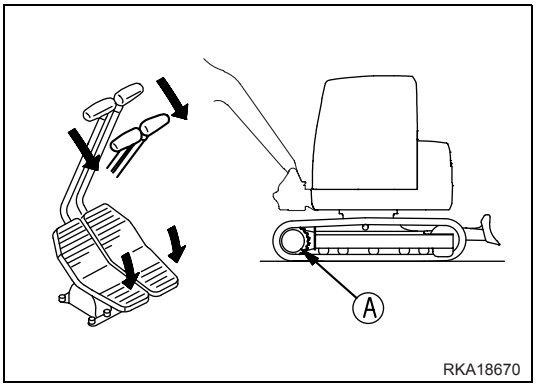
1. Release the safety lever (2) and lift the work equipment 40-50 cm from the ground.



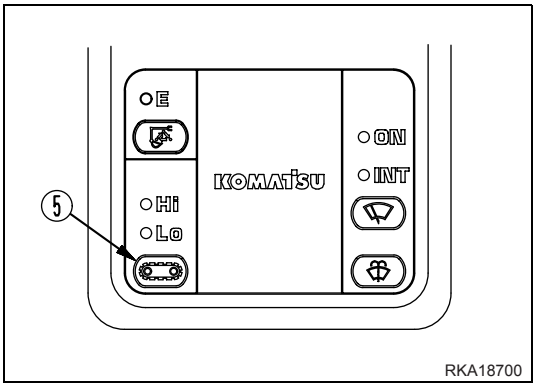
2. Lift the blade.
3. Opearate both travel levers (3) or both travel pedals (4) as explained below.
   - When the sprocket (A) is at the rear of the machine, push the lever (3) slowly forward or press the top of the pedal (4) slowly to move the machine off.



   - When the sprocket (A) is at the front of the machine, pull the lever (3) slowly backward or press the bottom of the pedal (4) slowly to move the machine off.



4. Switch over the travel speed by proceeding as follows.
   Press the travel speed selection switch (5) to change over from high (Hi)to low (Lo) speed and vice versa. The changeover from high to low speed or vice versa takes place whenever the switch is pressed.

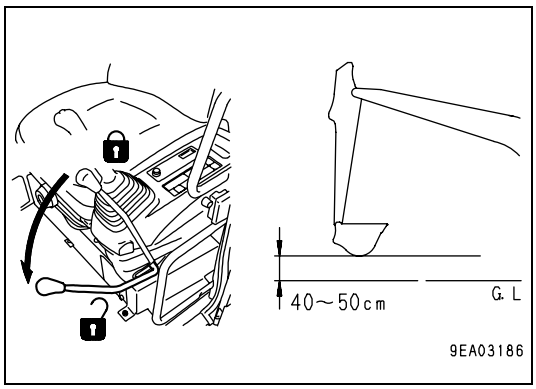


NOTE
- When the engine is started, the low speed is automatically selected. When the machine travels at high speed on soft ground or up a slope and the load increases, the low speed is automatically selected, but the travel speed increase warning light remains on. When the load is reduced, the travel system automatically changes over to high speed.

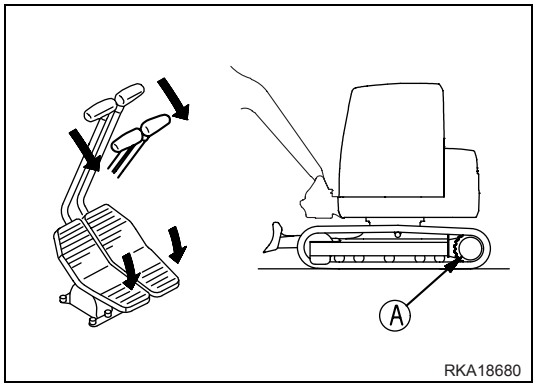
5. Make sure that the travel alarm functions correctly. If the alarm does not sound, contact your Komatsu Dealer, which will carry out the necessary repairs.

3.3.10.3 REVERSE

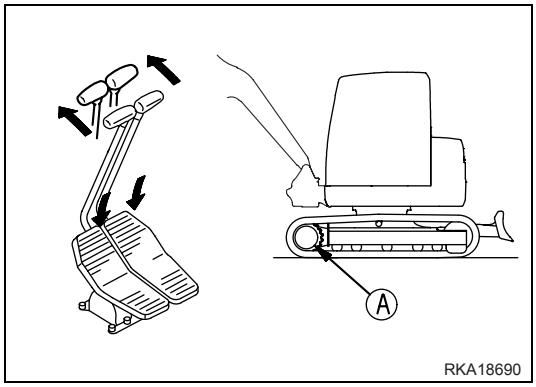
1. Release the safety lever (2) and lift the work equipment 40-50 cm from the ground.



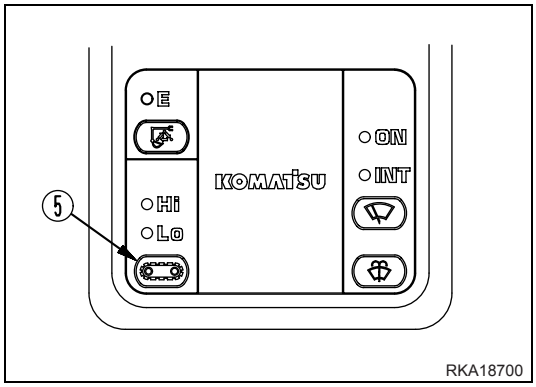
2. Lift the blade.
3. Opearate both travel levers (3) or both travel pedals (4) as explained below.
   - When the sprocket (A) is at the rear of the machine, pull the lever (3) slowly backward or press the bottom of the pedal (4) slowly to start moving in reverse.



   - When the sprocket (A) is at the front of the machine, push the lever (3) slowly forward or press the top of the pedal (4) slowly to start moving in reverse.



4. Switch over the travel speed by proceeding as follows.
   Press the travel speed selection switch (5) to change over from high (Hi)to low (Lo) speed and vice versa. The changeover from high to low speed or vice versa takes place whenever the switch is pressed.



NOTE
- When the engine is started, the low speed is automatically selected. When the machine travels at high speed on soft ground or up a slope and the load increases, the low speed is automatically selected, but the travel speed increase warning light remains on. When the load is reduced, the travel system automatically changes over to high speed.

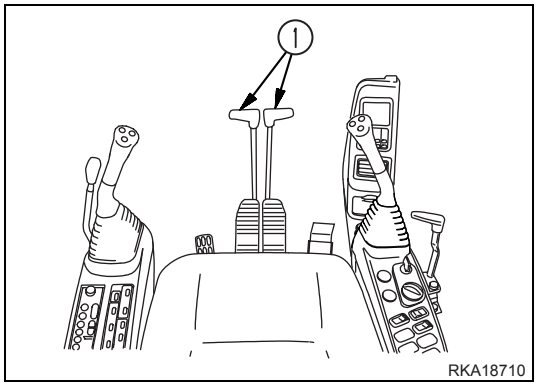
5. Make sure that the travel alarm functions correctly. If the alarm does not sound, contact your Komatsu Dealer, which will carry out the necessary repairs.

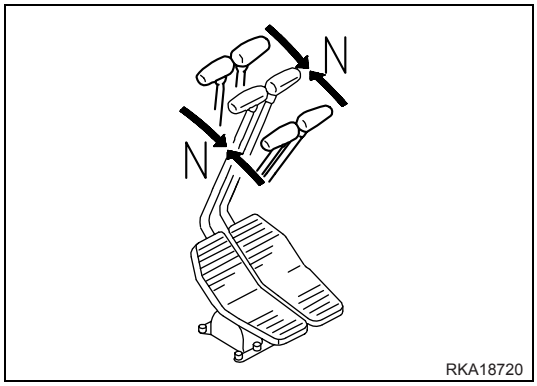
3.3.10.4 HOW TO STOP THE MACHINE

⚠ WARNING

- **Avoid stopping the machine abruptly. Always calculate a sufficient safety distance when stopping.**

Shift the right and left travel levers (1) to neutral, then stop the machine.





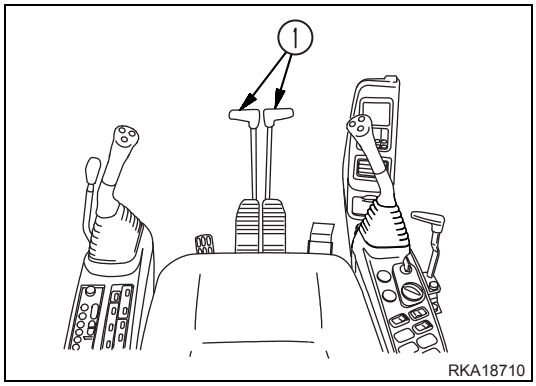
3.3.11 STEERING (CHANGING DIRECTION)

3.3.11.1 STEERING

⚠ WARNING

- **Before operating the travel control levers, check the position of the sprocket. If the sprocket is at the front, the operation of the travel levers is inverted.**
- **Avoid abrupt changes of direction as much as possible. Carry out counter rotations with the machine at rest.**
- **Due to the strong friction generated by changes of direction, do not use the travel speed increase control.**

Use the travel levers to change direction.
If possible, avoid changing direction suddenly. In particular, when carrying out a counter-rotation, stop the machine before steering.
Operate the two travel levers (1) as follows.

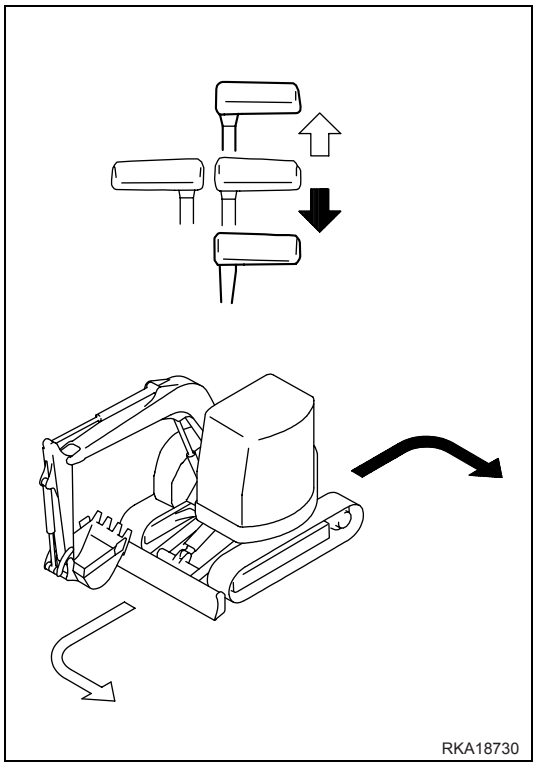


CHANGING DIRECTION WITH THE MACHINE AT REST

Push the right travel lever forward to steer to the left moving forward; pull the lever backward to steer to the left moving in reverse.

NOTE

- To steer to the right, operate the left travel lever in the same way.

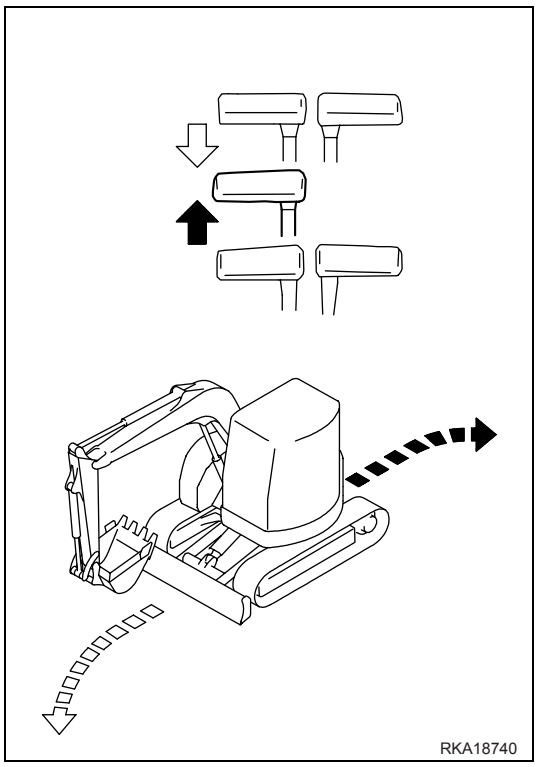


CHANGING DIRECTION WHEN THE MACHINE IS MOVING

Shift the left travel lever to neutral to steer to the left while travelling forward.

NOTE

- To steer to the right, operate the right travel lever in the same way.

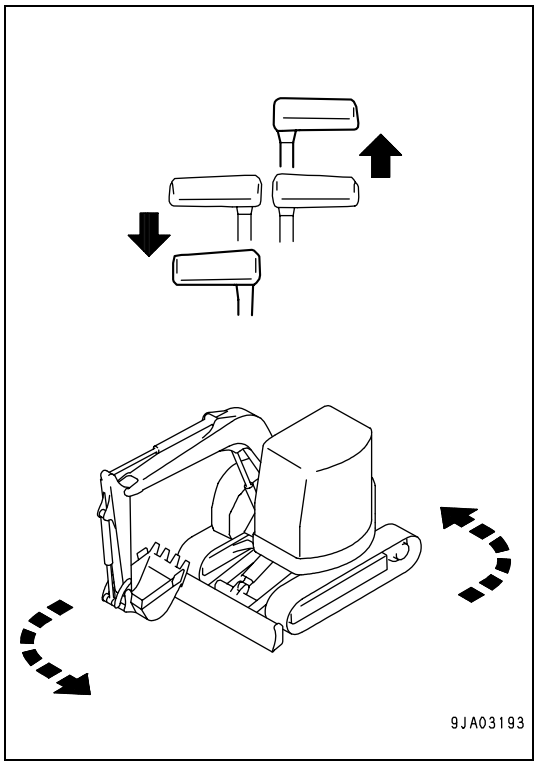


HOW TO CARRY OUT COUNTER-ROTATIONS (SPIN TURN)

To carry out a counter-rotation to the left, pull the left travel lever backward and push the right travel lever forward.

NOTE

- To carry out a counter-rotation to the right, pull the right travel lever backward and push the left travel lever forward.

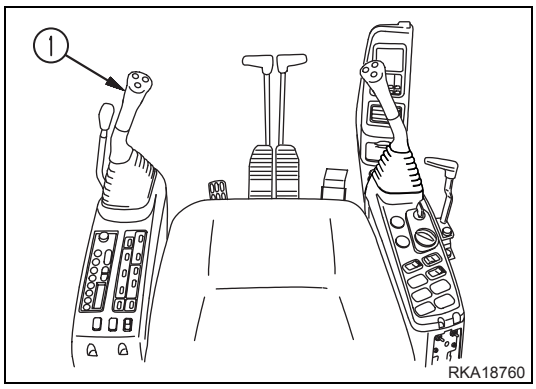


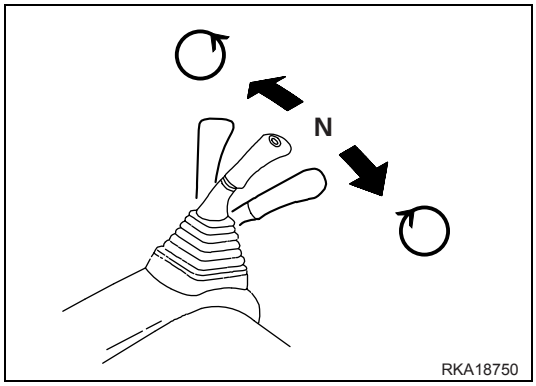
3.3.12 SWINGING THE TURRET

⚠ WARNING

- **Before using the swing function, make sure that the surrounding area is free of obstacles.**

1. Use the left work equipment control lever (1) to swing the turret.
2. When the swing function is not used, shift the left work equipment control lever (1) to neutral (N).
   The swing brake will be engaged.

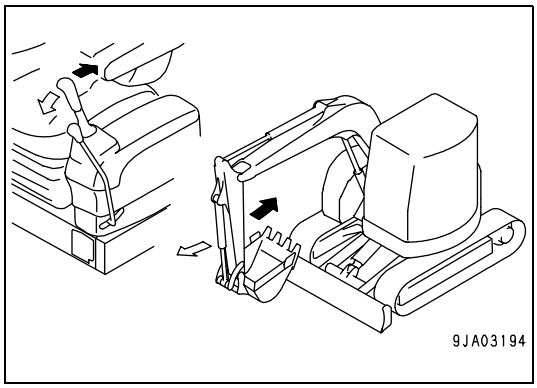




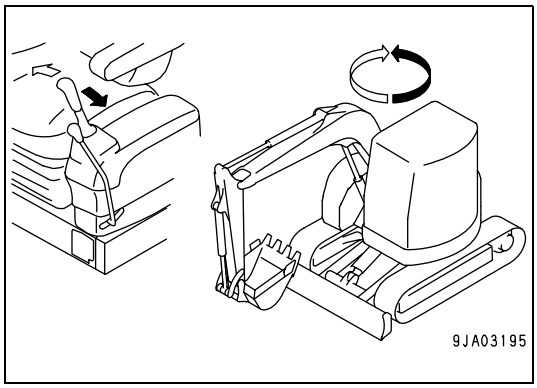
3.3.13 WORK EQUIPMENT CONTROLS AND FUNCTIONS

The work equipment is controlled by means of the right and left work equipment control levers. The left lever controls the arm and the turret swing, while the right lever controls the boom and the bucket. When the levers are released, they automatically return to the neutral position and the work equipment remain in the position where they stopped.
The movements of the levers and the corresponding movements of the equipment are shown in the diagrams below.

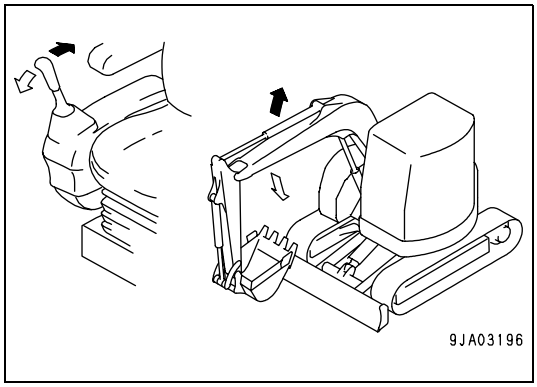
- **Arm control**
  Shift the left work equipment control lever forward or backward to operate the arm.



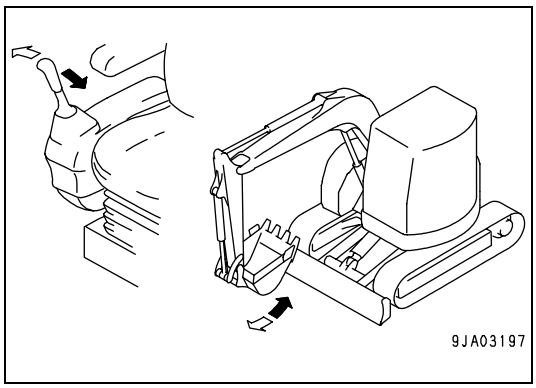
- **Swing control**
  To swing the turret, shift the left control lever to the left or to the right.



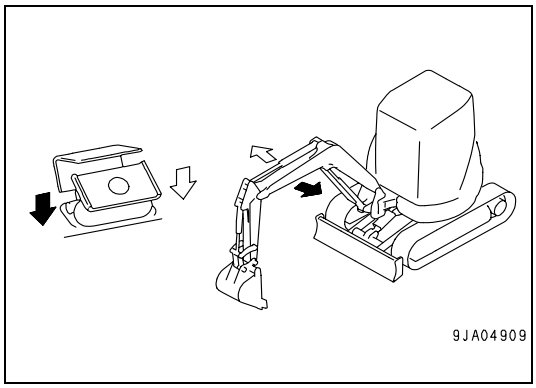
- **Boom control**
  To operate the boom, shift the right work equipment control lever forward or backward.



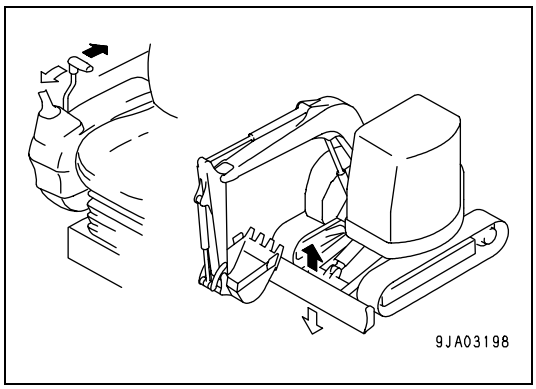
- **Bucket control**
  To operate the bucket, shift the right control lever to the left or to the right.



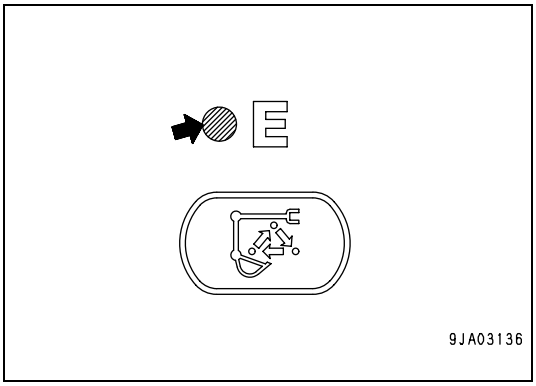
- **Boom swing control**
  To swing the boom, press the control pedal.



- **Blade control**
  Shift the lever positioned to the right of the operator seat forward or backward to operate the blade.



3.3.14 WORK MODE



The work mode selection switch allows the most suitable work mode to be selected according to the operations to be carried out and facilitates work.
Proceed as indicated below to use the different work modes effectively.

The Active mode (for heavy-duty applications) and the E mode (when fuel saving is desired) alternate every time the switch is pressed.

NOTE
- When the engine is started, the Active mode (for heavy-duty applications) is automatically selected.

Work mode	Warning light (E)	Applications	Set speed* (rpm)
Active (for heavy-duty applications)	Off	normal digging operations, loading operations	2300 ± 50
E (when fuel saving is desired)	On	normal digging operations, loading operations (when fuel saving is desired)	2000 ± 100

*: this value corresponds to the engine rpm with the hand accelerator set to MAX. without load.

NOTE
- When changing over from the Active mode to the E mode with the hand accelerator set to MAX., the engine rpm in some way decrease, but this is not an anomaly.

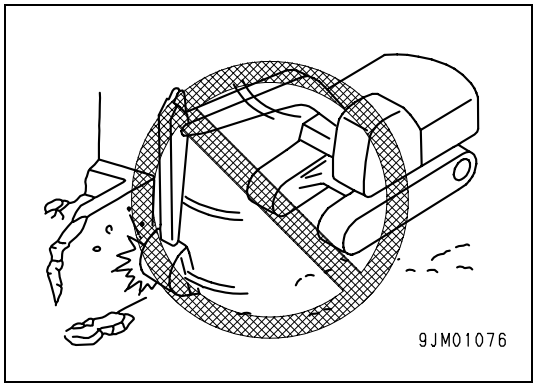
3.3.15 UNAUTHORIZED OPERATIONS

⚠ WARNING

- **Do not attempt to operate the work equipment control levers during travel.**

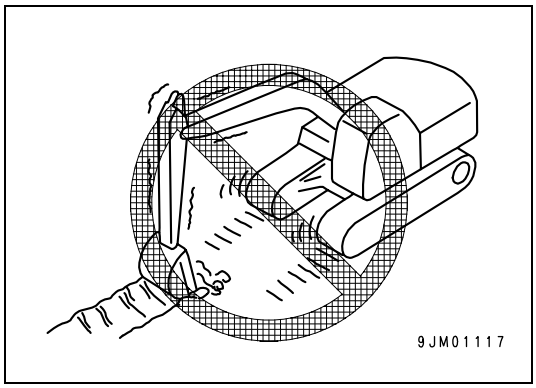
OPERATIONS IN WHICH THE SWING FORCE IS EXPLOITED

Do not use the swing force to compact the ground or break objects. Beside being dangerous, this will certainly shorten the life of the machine.



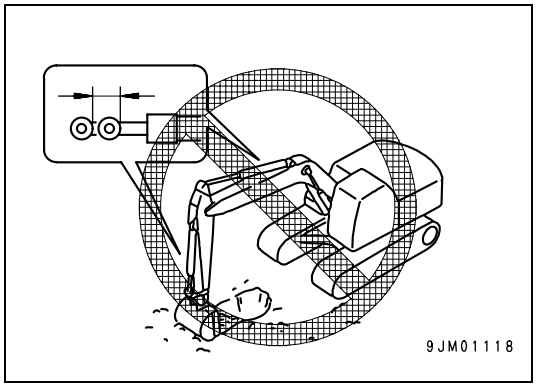
OPERATIONS IN WHICH THE TRAVEL FORCE IS EXPLOITED

Do not thrust the bucket into the ground and do not use the travel force of the machine to carry out digging operations, since this may damage the machine or the work equipment.



OPERATIONS IN WHICH THE HYDRAULIC CYLINDERS REACH THE END OF STROKE

If the work equipment is used with the cylinder rods at the end of stroke and is subjected to impacts due to external forces, the hydraulic cylinders run the risk of being damaged and the operator of being injured. Avoid performing operations in which the hydraulic cylinders are extended or retracted completely.

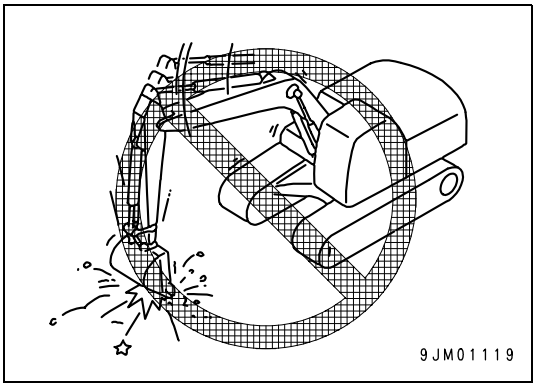


DIGGING OPERATIONS ON HARD ROCKY GROUND

Do not attempt to dig directly into hard rocky ground with the work equipment. It is advisable to carry out the digging operations after breaking the rock with another means. This will not only safeguard the machine, but also ensure a more economic use of the same.

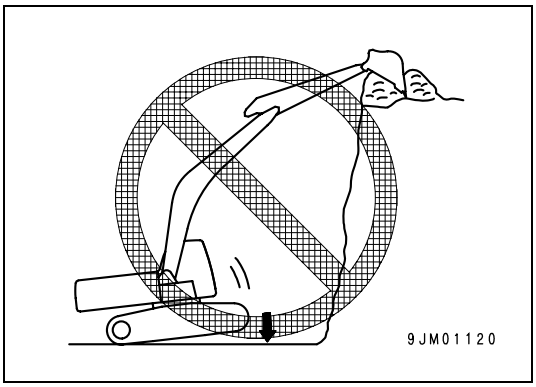
OPERATIONS IN WHICH THE FALL FORCE OF THE BUCKET IS EXPLOITED

Do not exploit the fall force of the machine when performing digging operations or the fall force of the bucket to use it as a pick-axe, breaker or pile driver, since this may considerably reduce the life of the machine.



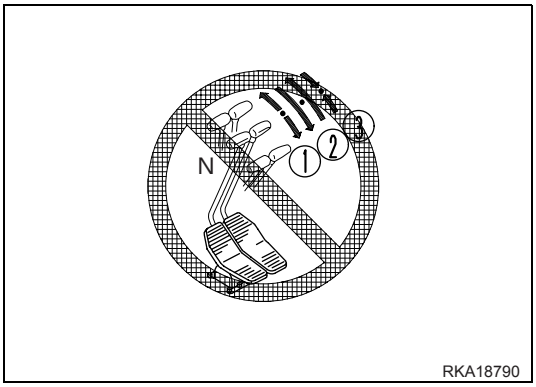
OPERATIONS IN WHICH THE FALL FORCE OF THE MACHINE IS EXPLOITED

Do not exploit the fall force of the machine to carry out excavations.



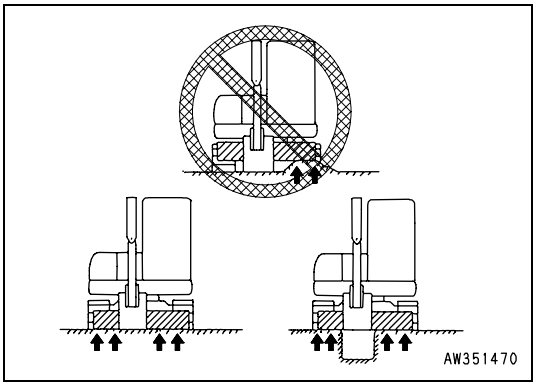
SUDDEN MOVEMENTS OF THE LEVERS

1) Do not shift up or down suddenly, since this may cause the machine to start abruptly.
2) Avoid any sudden shifting from forward to reverse (or vice versa).
3) Avoid any sudden manoeuvre, for example stopping abruptly when the machine is running at very high speed (releasing the lever).



OPERATIONS IN WHICH THE BLADE IS USED AS SUPPORT ON ONE SIDE ONLY

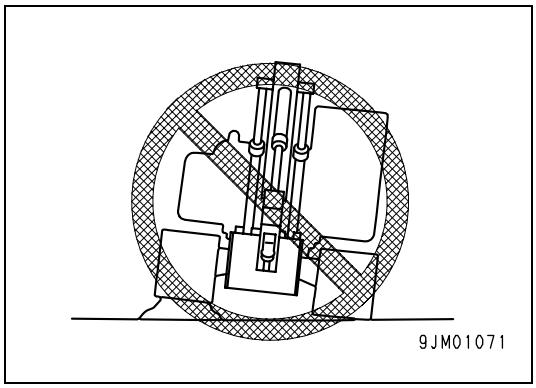
When using the blade as a support for the machine, do not rest the machine only on one end of the blade.



3.3.16 IGENERAL INFORMATION ON THE OPERATION OF THE MACHINE

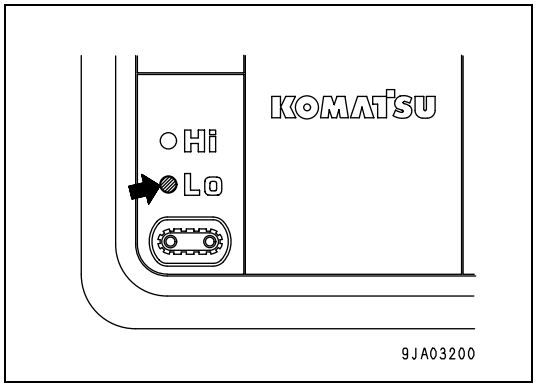
TRAVEL FUNCTION

Travelling over boulders, tree stumps, or other obstacles means submitting the frame (and in particular the tracks) to considerable stress, and this may damage the machine. For this reason, always remove any obstacles and avoid passing over them.
If an obstacle cannot be avoided, reduce the travel speed, lower the work equipment to the ground and try to manoeuvre the machine so that the obstacle is equidistant from the tracks.



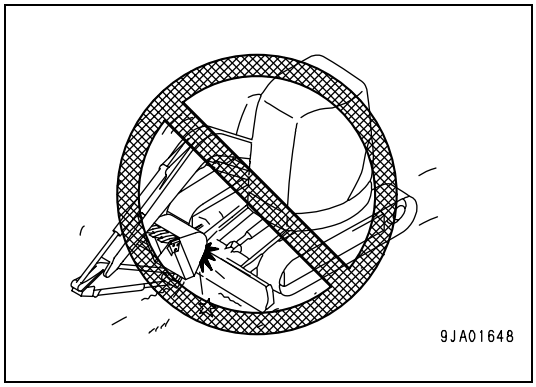
TRAVELLING AT HIGH SPEED

When the machine travels on rocky ground, with many uneven stretches or with plenty of stones, always travel at low speed (“Lo” warning light on). If the machine travels at high speed (“Hi” warning light on), manoeuvre the machine so that the idler roller faces the travelling direction.



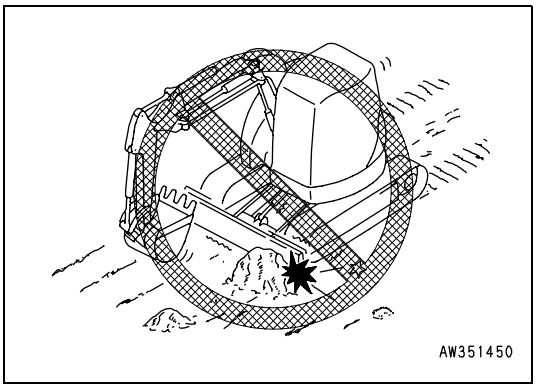
FOLDING THE WORK EQUIPMENT

When folding the work equipment to the travel or transport position, be careful to prevent the bucket from hitting the blade.



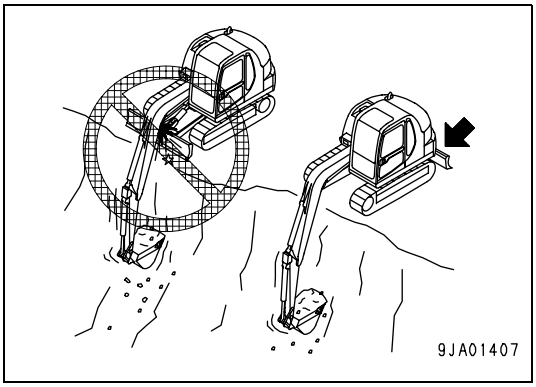
AVOID HITTING THE BLADE

Be careful not to hit the blade against rocks or boulders, since this may damage the blade or the cylinders.



POSITION OF THE BLADE DURING DIGGING OPERATIONS WITH THE EXCAVATOR

When carrying out deep digging operations with the blade at the front, be careful to prevent the boom cylinder from hitting the blade. If possible, always position the blade at the rear of the machine.

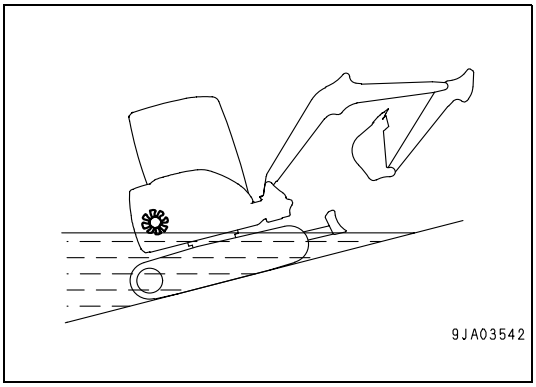


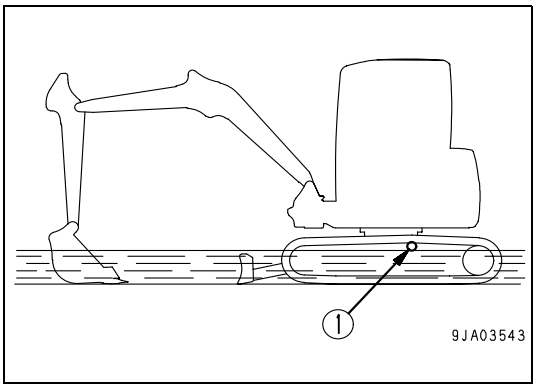
MAXIMUM WATER DEPTH

⚠ CAUTION

- **When driving the machine out of water, if the inclination of the machine exceeds 15°, the rear of the turret will be submerged, and this may cause the cooling fan to break.**
  Be extremely careful when driving the machine out of water.

Do not work with the machine immersed in water if the depth exceeds the allowed limits (under the centre of the carrier roller (1)). Furthermore, when a component has been immersed in water for a long time, grease it using a pump until the old grease comes out of the bearings (around the bucket pins).



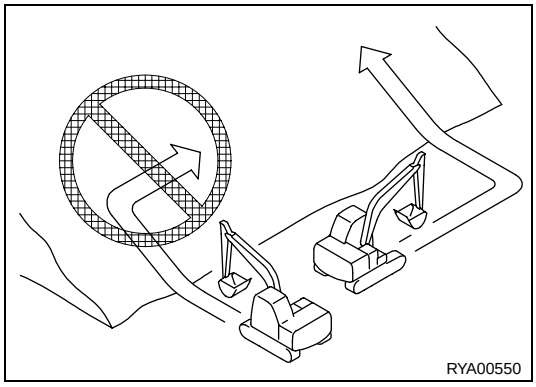


3.3.17 MOVING ON SLOPES

⚠ WARNING

- **When travelling downhill on steep slopes, slow down using the travel levers and the hand accelerator.**
  Do not travel downhill on slopes whose inclination exceeds 15°.
- **Steering or using the work equipment during operations on slopes may cause the machine to lose balance and overturn, therefore it is advisable to avoid such operations.**
  It is particularly dangerous to swing the turret on slopes when the bucket is full.
  If such operations have to be carried out, pile soil and create a platform, so that the machine can be kept horizontal during work.
- **Do not travel up or down steep slopes, since the machine may overturn.**
- **During travel, lift the machine at about 20-30 cm from the ground.**
  Do not move the machine downhill in reverse.
- **Do not change direction on slopes; side movements must be carried out on level ground, or with inclination not exceeding 10° .**
- **Always operate the machine or travel in such a way as to be able to stop it safely at any time if it slips or becomes unstable.**
- **When travelling uphill, if the tracks slip or if it is impossible to keep moving exploiting only the track force, do not use the thurst force of the arm to move the machine more easily. The machine runs the risk of overturning.**

1. When the machine travels downhill, the sprocket (1) must be positioned on the side of the machine that is directed downward.
   If the machine travels downhill with the sprocket (1) on the side that is directed upward, the tracks tend to loosen and the machine may slip.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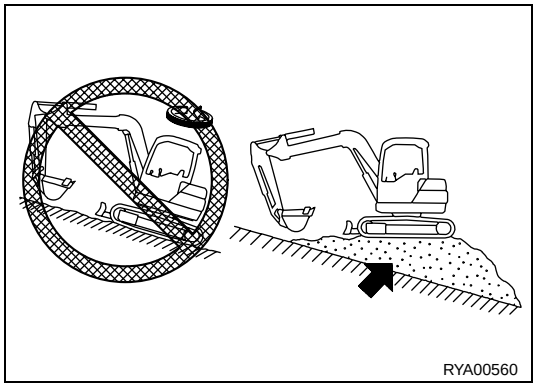
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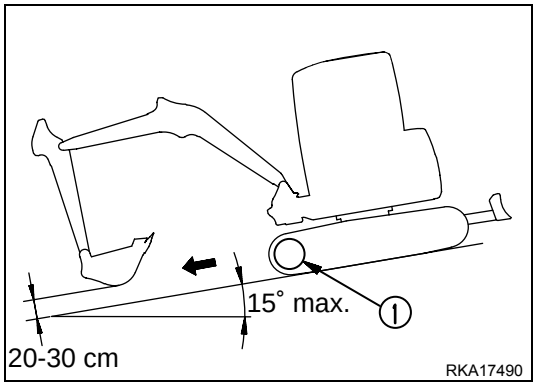
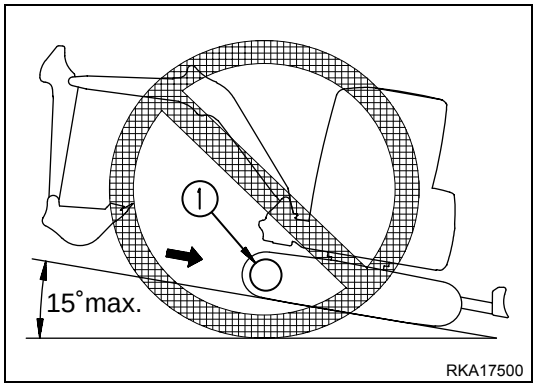
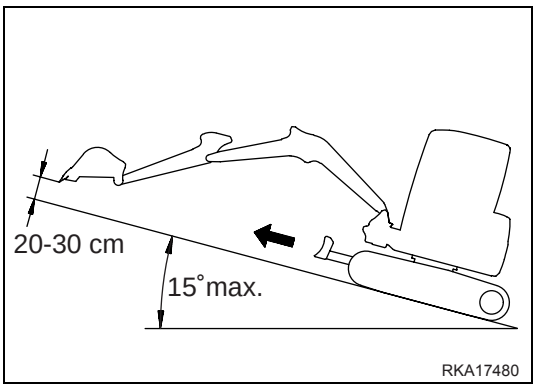


RKA17490



RKA17500

2 - When travelling uphill on a slope, position the work equipment as shown in the diagram on the right.



BRAKING WHEN TRAVELLING DOWNHILL

To brake when travelling downhill, shift the travel levers to the neutral position. In this way the brake will be applied automatically.

WHEN THE ENGINE STOPS ON A SLOPE

If the engine stops while the machine is travelling uphill, shift the travel levers to neutral, stop the machine, then start the engine again.

PRECAUTIONS TO BE TAKEN ON SLOPES

- If the engine stops when the machine is on a slope, do not use the left work equipment control lever to swing the turret. The turret will swing due to its own weight.
- Do not open or close the sliding door while travelling on slopes or carrying out any operation. The effort required may change suddenly. Always keep the sliding door locked.
- Pay special attention when opening or closing the sliding door while the machine is at rest on a slope. The weight of the door may cause it to be opened or closed suddenly.

3.3.18 GETTING THE MACHINE OUT OF MUD

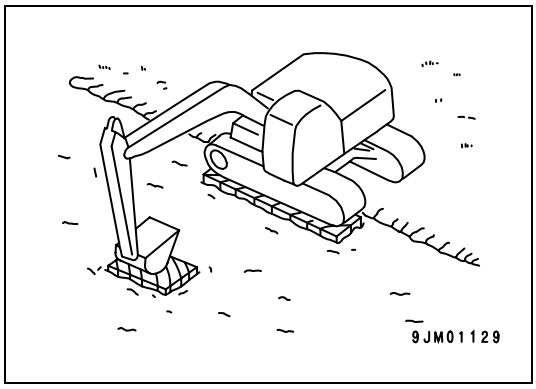
Always proceed carefully to avoid getting stuck in mud. However, if the machine gets stuck in mud, proceed as indicated below.

WHEN ONE SIDE ONLY GETS STUCK

NOTE

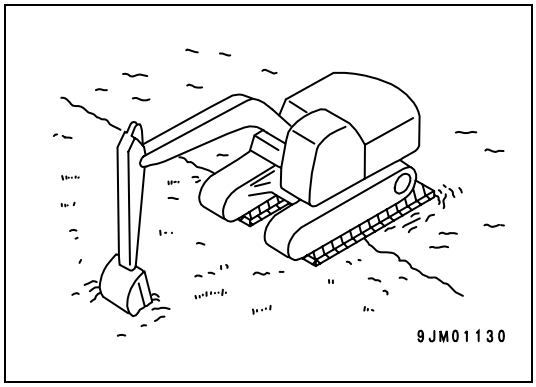
- When using the boom or arm to raise the machine, always place the bottom of the bucket in contact with the ground. (Never push with the bucket teeth.) The angle between the boom and the arm should be included between 90° and 110°.

When only one side gets stuck in mud, use the bucket to raise the track, then lay boards or logs under the track and drive the machine out.



WHEN BOTH SIDES GET STUCK

When both tracks get stuck in mud and the machine slips but cannot move, put some boards or logs under the tracks, proceeding as indicated above. Thrust the bucket into the ground in front of the machine, operate the arm as for normal digging operations and shift the travel levers to position FORWARD to drive the machine out of mud.

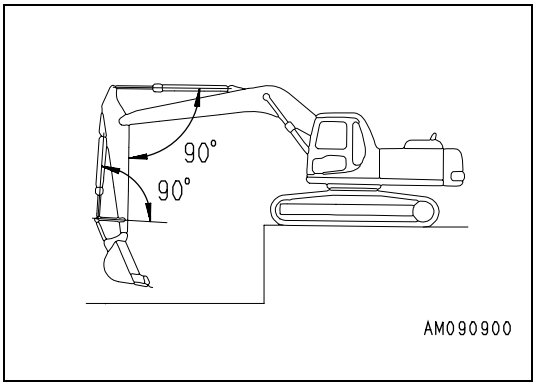


3.3.19 OPERATIONS THAT CAN BE PERFORMED WITH THE HYDRAULIC EXCAVATOR

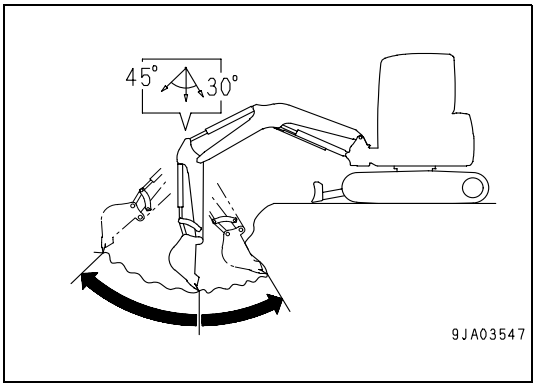
In addition to those indicated below, many other applications are possible, thanks to the use of various attachments.

DIGGING WITH REVERSED BUCKET

The excavator is suitable for carrying out digging operations in a lower position with respect to the machine.
When the machine is in the position shown in the diagram on the right, the maximum digging and thrusting force of each cylinder is achieved when the bucket cylinder and its articulated joint, the arm cylinder and the arm are at 90° with respect to each other.
During the digging operations, keep this angle amplitude to optimize the performance of the machine.

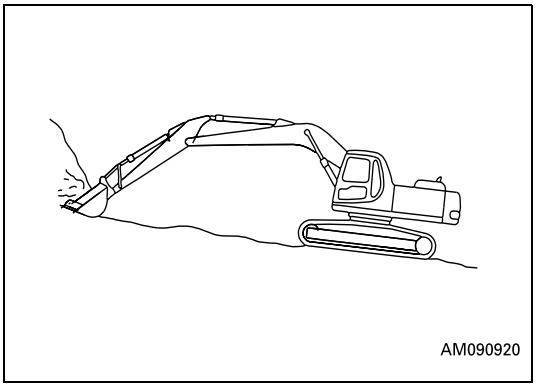


The operating range for digging operations with the arm is included between an angle of 45° away from the machine and an angle of 30° towards the machine.
There may be differences depending on the digging depth, but it is advisable to work within this range rather than making the cylinder reach the end of stroke.



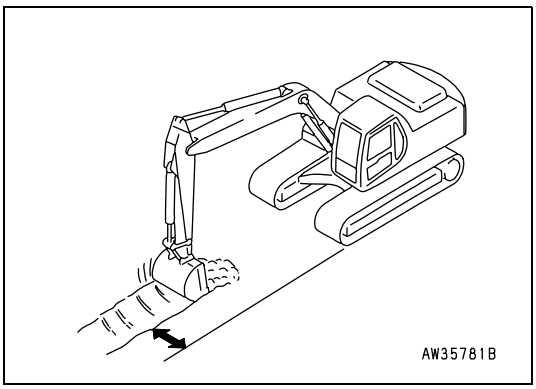
DIGGING WITH FRONT BUCKET

The bucket is suitable for carrying out digging operations in a higher position with respect to the machine.
It is possible to carry out loading operations by installing the bucket in reversed position.



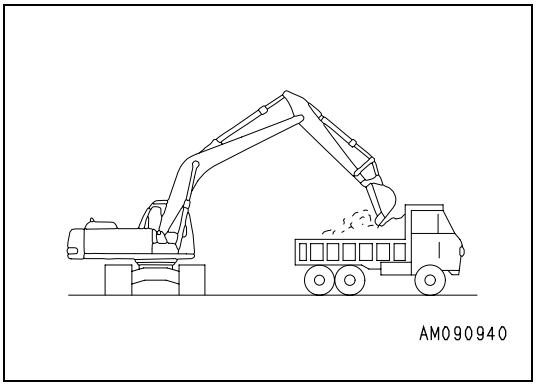
SIDE DITCHING

Ditch digging operations may be effectively carried out by installing a bucket suitable for this type of work and by positioning the tracks parallel to the ditch digging line.
To create wide ditches, first dig on both sides and then remove the earth at the centre.



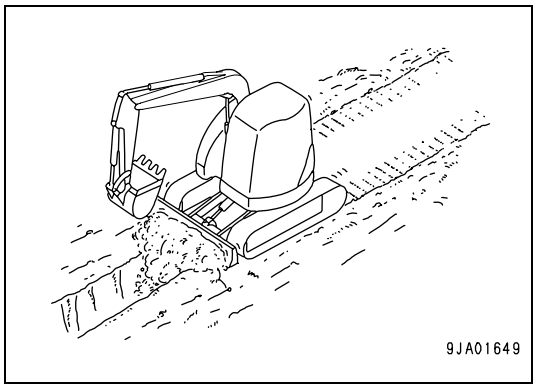
LOADING THE MACHINE

In places where the swinging angle is reduced, the effectiveness of the operation can be increased by positioning the truck so that the operator can see it.
The loading operation is easier and the loading capacity higher if the hydraulic excavator loads the truck from the back and not from the sides.



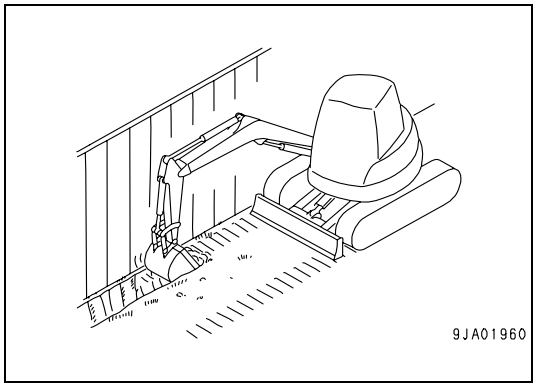
FILLING AND LEVELLING OPERATIONS

Use the blade to fill the excavations and to level the ground surface.



SIDE DITCHING WORK

The machine can be used to create side ditches by exploiting the combined action of the turret and boom swing functions.



3.3.20 CHANGING THE BUCKET

⚠ WARNING

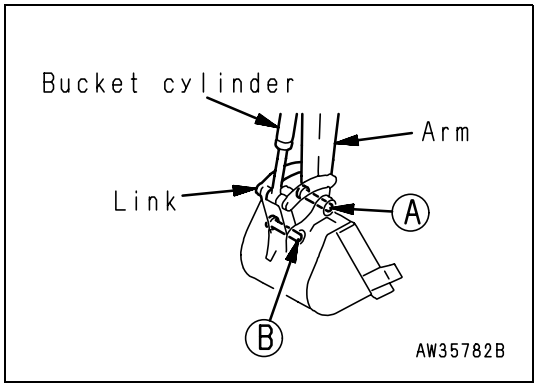
- **When the coupling pins are removed or installed, chips may come off; always use gloves, goggles and helmet.**
- **The change of the equipment must be carried out by two operators, who must decide together the words and signals to be used during work.**
- **Avoid using your fingers to align the holes, since they may be cut off in case of sudden or uncontrolled movements.**
- **The described procedures are valid also for the coupling of the mechanical connections of the optional equipment.**

To carry out the work, stop the machine on firm and level ground. When working in a team, it is necessary to appoint a supervisor and follow his instructions and signals.

1. Position the bucket in contact with the ground.

NOTE

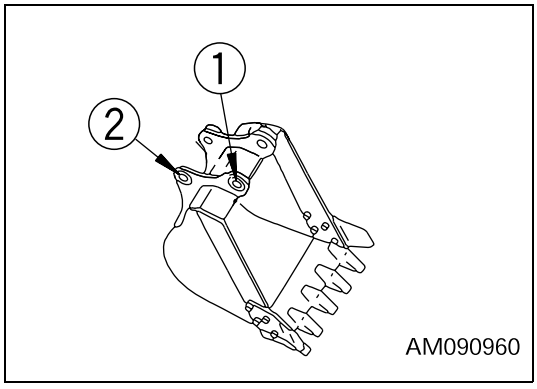
- When removing the pins, position the bucket so that its contact with the ground is superficial. If the contact of the bucket with the ground is complete or it has been lowered too powerfully, resistance increases and it becomes more difficult to remove the pins.



IMPORTANT

- **After removing the pins, make sure that they do not come into contact with mud or sand. Both ends of the bushings are equipped with dust seals that must not be damaged.**

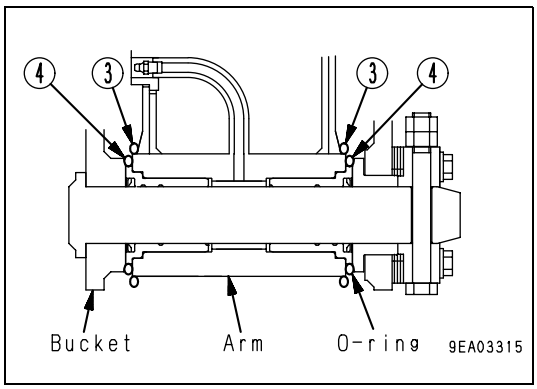
2. Remove the lock bolts and the nuts, then extract the pins (A) and (B) and remove the bucket.
3. Align the arm with the holes (1) of the bucket to be installed and the articulation with the holes (2), then grease the pins (A) and (B) and fit them in the holes (1) and (2), respectively.



IMPORTANT

- **Install the bucket carefully following the reverse order.**
- **During the installation of the bucket the O-rings may be easily damaged, therefore it is advisable to position them in the arm as shown in the diagram (3) on the right. When hitting the pins, move the O-ring downward in the apposite groove (4).**

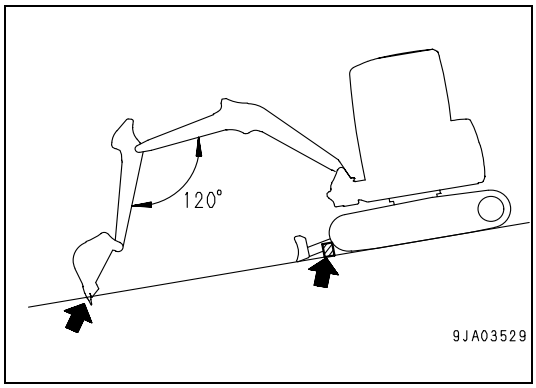
4. Install the lock bolts on each pin, then grease it.



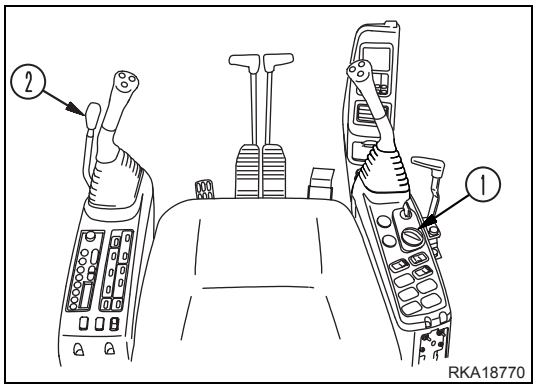
3.3.21 PARKING THE MACHINE

⚠ WARNING

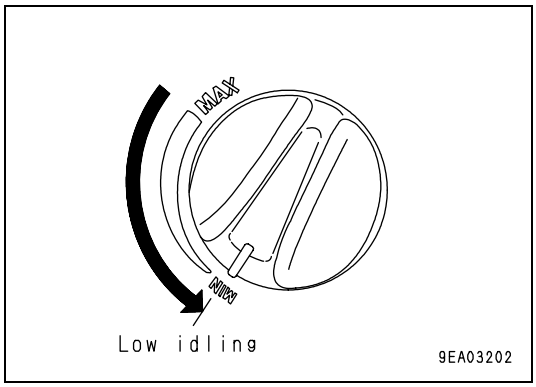
- **Park the machine on firm and level ground. Avoid parking the machine on slopes. If it is absolutely necessary to park the machine on a slope, put blocks under the tracks and thrust the work equipment into the ground to prevent the machine from moving.**
- **If the control levers are inadvertently touched, the work equipment or the machine may move suddenly and cause serious accidents. Before leaving the operator seat, shift the safety lever to the "locked" position.**
- **Position the blade facing downhill and lower it to the ground.**



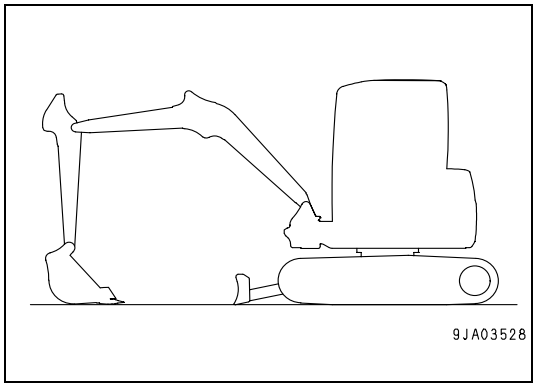
1. Stop the machine. For further details on how to stop the machine, see "3.3.10.4 HOW TO STOP THE MACHINE".



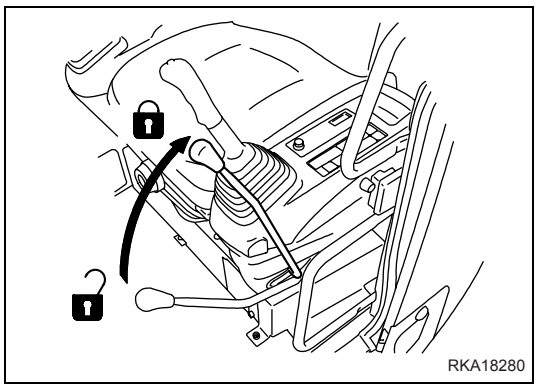
2. Reduce the engine rpm to MIN., using the hand accelerator (1).



3. Lower the bucket keeping it in horizontal position, until its bottom touches the ground.
4. Lower the blade to the ground.

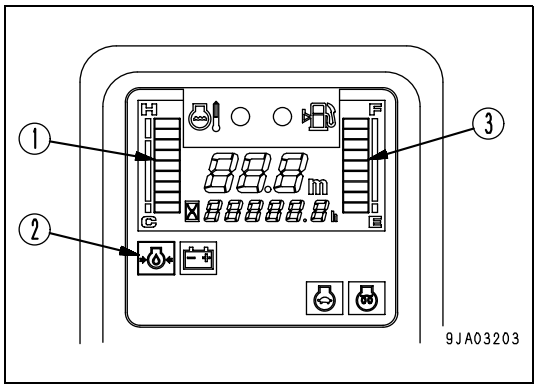


5. Shift the safety lever (2) to the “locked” position.



3.3.22 CHECKS TO BE CARRIED OUT ON THE MACHINE AT THE END OF THE WORK DAY

Check the engine coolant temperature (1), the engine oil pressure (2) and the fuel level (3) on the machine monitor.



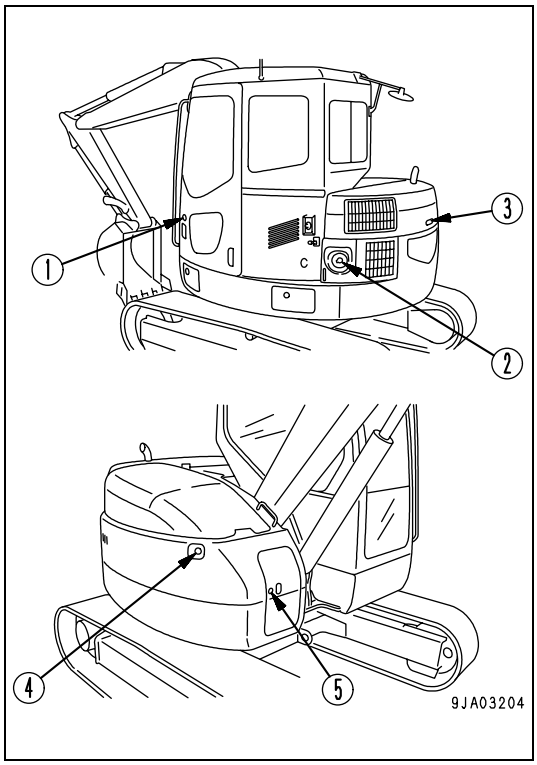
3.3.23 LOCKING THE MACHINE

Do not forget to lock:

1) Cab door
2) Fuel filler flap
3) Engine hood
4) Side cover
5) Battery inspection cover

NOTE

- Use the ignition key to open and lock the doors and covers listed above.



3.3.24 ROAD LINERS AND RUBBER TRACKS

(for machines equipped with road liners or rubber tracks)

3.3.24.1 INFORMATION ON THE ROAD LINERS AND THE RUBBER TRACKS

The road liners and the rubber tracks have exceptional characteristics that cannot be found in steel tracks. However, if they are used as if they were steel tracks, it is impossible to exploit all the advantages they offer.
Do not subject the road liners or the rubber tracks to excessive stress and always take in consideration the conditions of the worksite and the nature of the operations to be performed.

Comparative table – Road liners, rubber tracks and steel tracks

	Road liners	Rubber track	Steel track
Reduction of vibrations	Excellent	Excellent	Average
Smooth travel	Good	Excellent	Good
Noiselessness	Excellent	Excellent	Average
Reduction of damages to paved surfaces	Excellent	Excellent	Average
Manoeuvrability	Average	Excellent	Average
Resistance to damage	Good	Average	Excellent
Traction force	Excellent	Excellent	Excellent

Considering the properties of the material used, rubber tracks offer various advantages. However, their weak point is limited resistance. Consequently, it is important to understand what advantages are offered by the road liners and the rubber tracks and to take the necessary precautions for use, avoiding operations that are not allowed. This will increase the duration of the road liners and the rubber tracks and will allow their characteristics to be fully exploited. Before using the road liners or the rubber tracks, read paragraph "3.3.24.3 USING THE ROAD LINERS AND THE RUBBER TRACKS".

3.3.24.2 WARRANTY ON THE ROAD LINERS AND THE RUBBER TRACKS

It is important to carry out inspections and maintenance operations and to ensure that the track tension is always correct. Furthermore, these tracks should not be used near objects that may damage them, such as sharp steel plates, U-grooves, broken or pointed rocks, steel bars or scraps.
The warranty does not cover any damage due to the incorrect use of the machine.

3.3.24.3 USING THE ROAD LINERS AND THE RUBBER TRACKS

Unauthorized uses

Keep to the following instructions.

- Avoid steering or performing other operations on broken rocks, very hard rocks, steel bars, scraps, or near the edges of steel plates, since this may damage the road liners and the rubber tracks.
- In places like river beds, where there is a great quantity of large and small stones, these may get stuck in the road liners and the tracks, thus damaging them or causing them to come off. Carrying out levelling operations if the road liners or the tracks slip reduces their duration.
- Do not dirty the road liners and the rubber tracks with oil, fuel or chemical solvents. If one of these substances gets on the tracks, clean them immediately. Furthermore, do not travel on road surfaces that are dirty with oil.
- When the machine is going to remain unused for a long period (3 months or more), keep it indoors, away from direct sunlight and protected from rain.

- Do not use the machine in areas where the temperature is particularly high, for example in the presence of burning wood, hot steel plates or on roads that have just been asphalted.
- Do not use the machine lifting one track only by means of the work equipment. This damages the rubber tracks and may also cause them to come off.
- When the rubber parts of the road liners are worn out or damaged to the extent that the head of the bolts is scratched, change the track immediately. If the bolt heads break, they cannot be removed any more.
- When installing the road liners, always install them on all the articulations and on both sides. If they are installed on one side of the articulations only, their duration is reduced considerably.

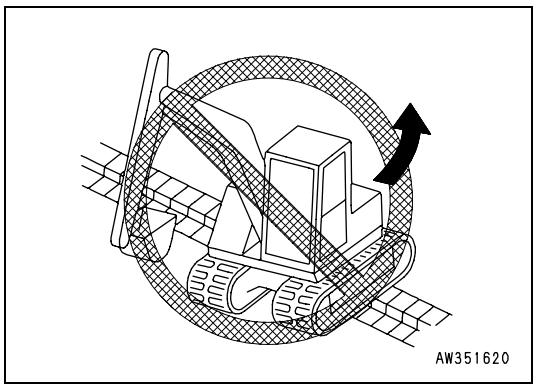
3.3.24.4 HOW TO PRESERVE THE ROAD LINERS AND THE RUBBER TRACKS OVER TIME

To avoid damaging the road liners and the rubber tracks, keep to the following instructions during work.

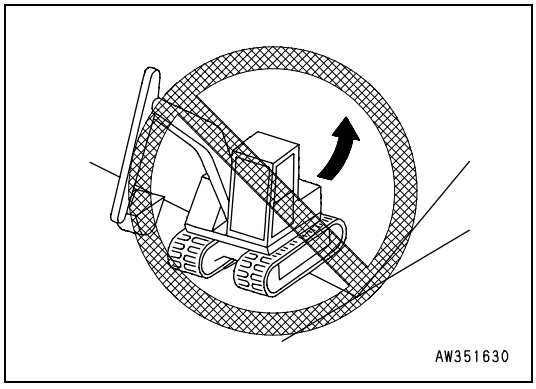
- Avoid counter-rotations on concrete surfaces, since concrete may scrape the rubber off.
- Avoid sudden changes of direction that may damage and wear out the road liners and the rubber tracks.
- Avoid steering when moving on surfaces with considerable differences in height. When moving on obstacles or surfaces with considerable differences in height, position the machine perpendicular to the obstacle to prevent the tracks from coming off.
- If the machine has been raised using the bucket, lower it slowly.
- Avoid using the machine to handle materials that once crushed produce oil (like soy, maize or other vegetable parts from which oil is derived); otherwise, wash the machine soon after use.
- Avoid any contact with materials that may affect the adhesion of the steel core, like salt, ammonium sulphate, potassium chloride, potassium sulphate or calcium superphosphate, or wash the machine after use.
- Since salt affects the adhesion of the steel core, avoid using the machine in coastal areas.
- When handling materials like salt, sugar, flour or soy seeds, the presence of deep cuts in the road liners or the rubber tracks may cause the infiltration of these products in the tracks or the dispersion of rubber pieces in the products. Always repair the tracks before use.
- Do not rub the tracks against concrete walls or blocks.
- Road liners and rubber tracks slip very easily on snow or icy surfaces. Take care not to slip while travelling or working on slopes.
- The characteristics of the road liners and the rubber tracks change when they are used in extremely cold areas, in particular their duration is reduced.
- In consideration of the properties of rubber, it is advisable to use the road liners and the rubber tracks at temperatures included between –25° C and +65° C (between -13°F and +149°F).
- When performing operations with the bucket, take care not to damage the road liners and the rubber tracks with the bucket itself.

To prevent the rubber tracks from coming off, pay the utmost attention to the following. Even when the track tension is correct, carry out every operation with the maximum care.

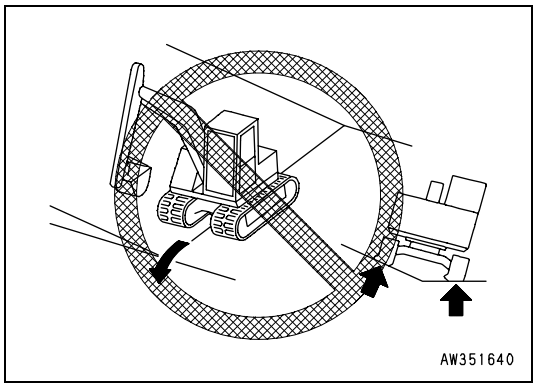
1. Avoid steering when moving on kerbs, rocks or areas with considerable differences in height (more than 20 cm). When the machine moves in these conditions, always position it perpendicular to the obstacles.



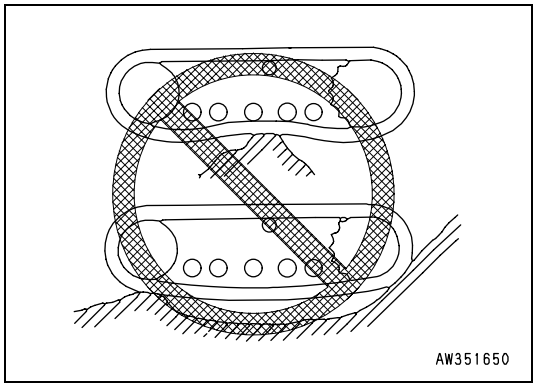
2. When travelling up slopes in reverse, avoid steering at the beginning of the slope. If it is necessary to steer on a slope, carry out this manoeuvre gradually.



3. Do not proceed along the edges of a slope or on uneven ground keeping one track in horizontal position and the other inclined or partially raised (with machine inclination exceeding 10°C). To avoid damaging the road liners and the rubber tracks, always proceed with both tracks resting on the same level surface.

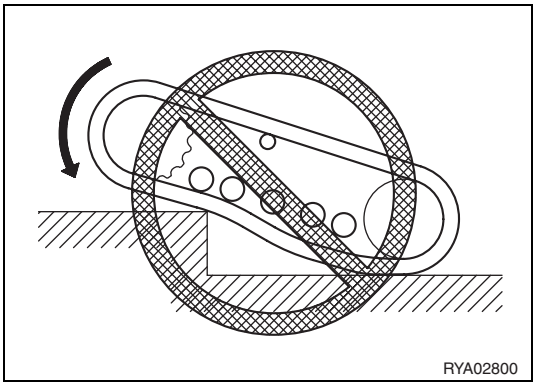


4. If the machine is operated as described in points from 1 to 3, the rubber tracks will become loose. Do not steer when the machine is in the positions shown in the figure.

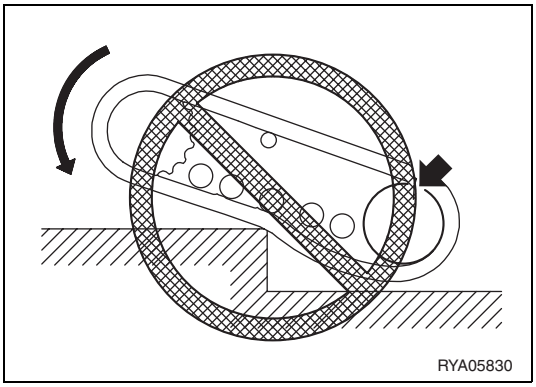


Detachment of the rubber track from the track frame

1. When the machine moves over an obstacle, a gap forms between the carrier roller and the rubber track. In these conditions, the rubber track may come off the sliding guide.

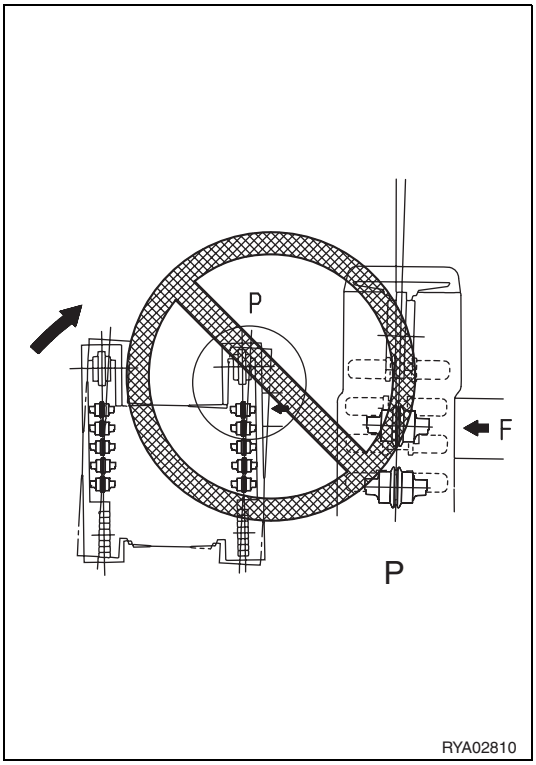


2. Furthermore, if the machine travels in reverse, a gap forms between the carrier roller, the idler roller and the rubber track.

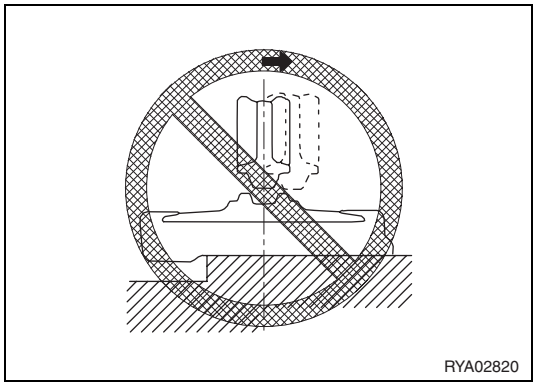


The rubber track may come off the guide also in the following conditions:

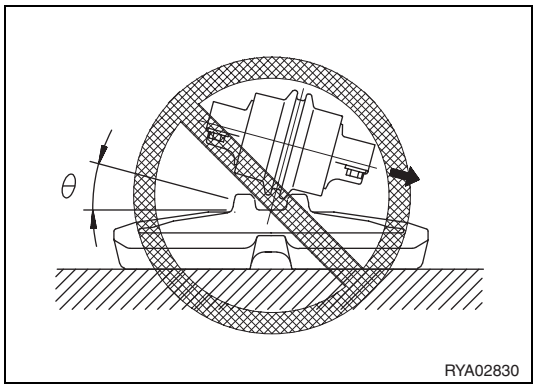
- When the machine steers, but the rubber track cannot move laterally due to the obstacle over which the machine is moving or due to any other obstacle.
- When the rubber track is not aligned and the idler roller or the carrier roller are not aligned with the centre.



- If the machine travels in reverse in these conditions, the rubber track will come off.



- If the machine steers in these conditions, the rubber track will come off.



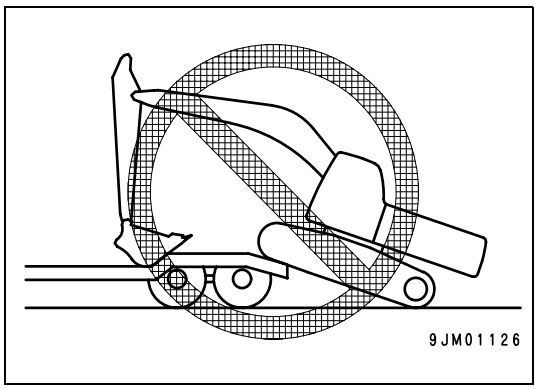
3.4 TRANSPORTING THE MACHINE

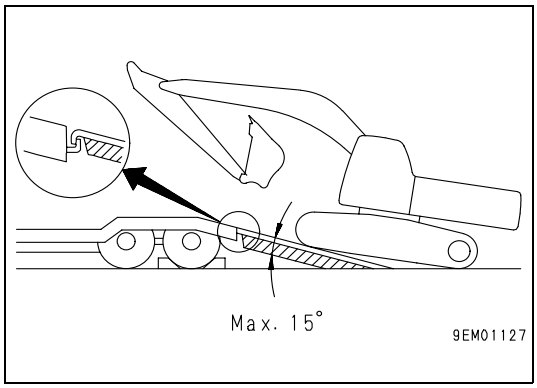
When transporting the machine, observe all the laws and regulations in force, paying special attention to safety.

3.4.1 TRANSPORT PROCEDURE

As a general rule, the machine must be transported on a trailer.
Choose the trailer according to the weight and dimensions of the machine indicated in paragraph "5.1 TECHNICAL DATA". It is important to remember that the weight and the transport dimensions indicated in the SPECIFICATIONS may vary depending on the type of track, boom, arm and on the other accessories installed on the machine.

3.4.2 LOADING AND UNLOADING THE MACHINE





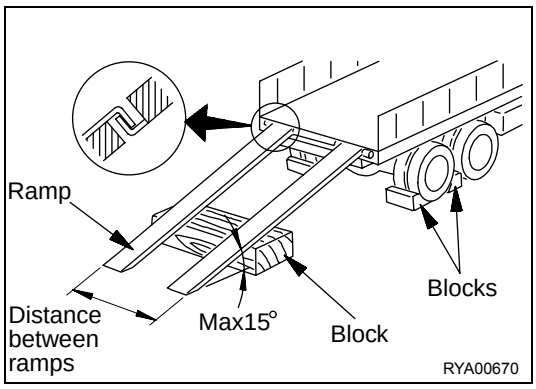
⚠ WARNING

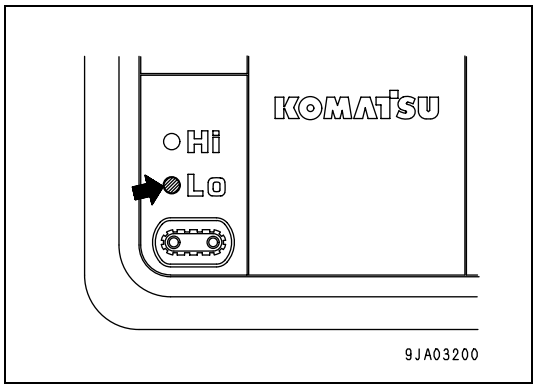
- **During loading and unloading operations, make sure that the low travel speed is selected (“Lo” warning light on) and always travel at low speed. During loading and unloading operations, let the engine idle, reduce speed and operate the machine slowly.**
- **When loading or unloading the machine, park the trailer on a firm and level surface. There should always be a sufficient safety distance between the road shoulder and the machine.**
- **Use ramps with ample width, length, thickness, and strength, and install them with a maximum inclination of 15°. When using piled soil, compact the piled soil fully to prevent the slope face from collapsing.**
- **Remove any mud from the undercarriage, to prevent the machine from slipping laterally when it is on the ramps. Remove any water, snow, grease, oil or other substances that may be present on the ramps.**
- **Do not change the trajectory of the machine on the ramps, since it may overturn. If necessary, move the machine down the ramps and find the correct direction.**
- **It is dangerous to use the work equipment for the loading and unloading operations.**
- **When the machine is on the ramps, do not operate any lever apart from the travel levers.**
- **The centre of gravity of the machine will change suddenly in the point where the ramps reach the truck or the semitrailer and the machine may overturn. At this point proceed very slowly.**
- **If the turret is swung when the machine is on the truck or trailer, the machine becomes unstable, therefore it is advisable to fold the work equipment and to swing the turret slowly.**
- **Always make sure that the sliding door of the cab is secured firmly, no matter whether it is open or closed. If the door is opened or closed on the ramps or on the flatbed, the operating effort may change suddenly. Do not open or close the door on the ramps or on the flatbed.**

During the loading and unloading operations, always use ramps or a platform and proceed as indicated below.

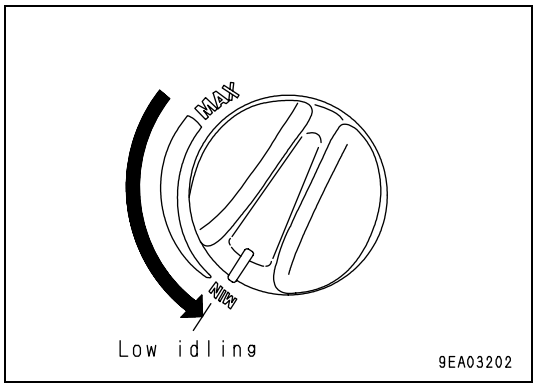
3.4.2.1 LOADING THE MACHINE

1. Loading and unloading operations must be carried out only on firm and level ground. Keep a safety distance from the edge of the road.
2. Engage the trailer brakes and place blocks under the trailer wheels to prevent it from moving.
   The distance between the ramps and their alignment must be adapted to the wheelbase of the trailer and the track gauge of the machine.
   Make sure that the two sides are at the same height.
   The inclination of the ramps cannot exceed 15°.
3. Select the low speed using the travel speed selection switch (warning light “Lo” on).

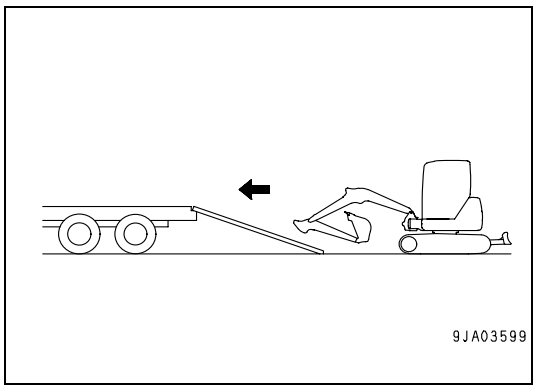




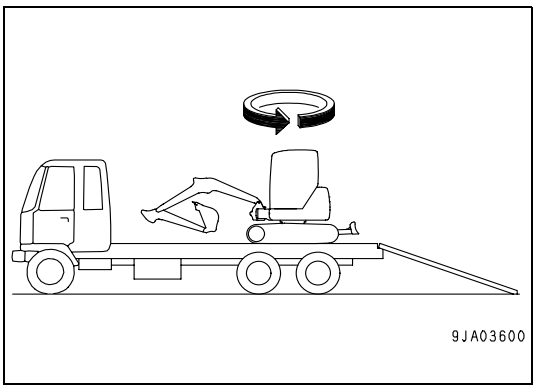
4. Run the engine at low speed.



5. During the loading operations, position the work equipment at the front and the blade at the rear of the machine, with the turret and the undercarriage parallel to each other.
6. Before getting on the ramps, make sure that the machine is in line with the ramps and that the centerline of the machine corresponds to the centerline of the trailer.
   Move the machine toward the ramps and travel slowly.
   Lower the work equipment as much possible, avoiding any contact with the trailer.
   When the machine is on the ramps, operate only the travel levers.

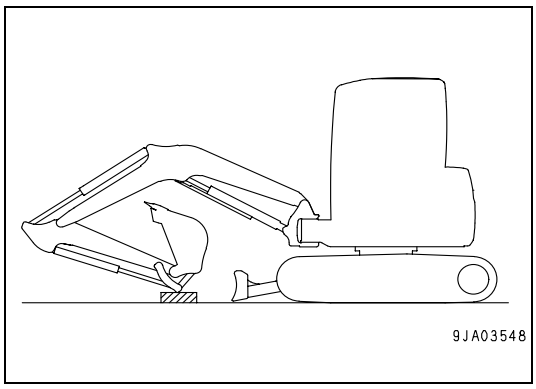


7. Stop the machine where required, then swing the turret slowly by 180°.



3.4.2.2 HOW TO SECURE THE MACHINE

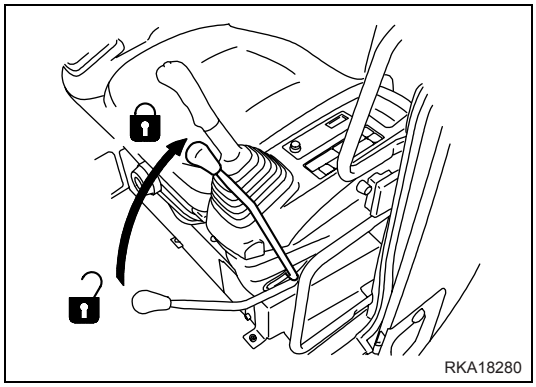
After loading the machine on the trailer, secure it by proceeding as indicated below.



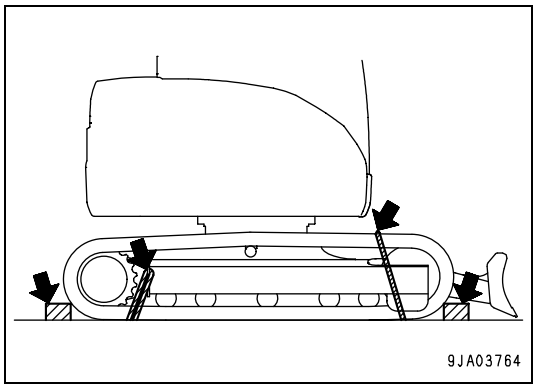
IMPORTANT

- **To avoid damaging the bucket cylinder during transport, position a wooden block at one end of the cylinder to prevent it from touching the ground.**

1. Lower the blade.
2. Extend the bucket and arm cylinders completely, then lower the boom slowly.
3. Stop the engine and remove the ignition key.
4. Lock all the control levers with the safety lever.

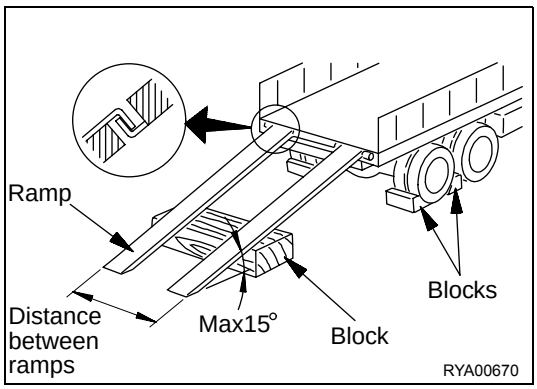


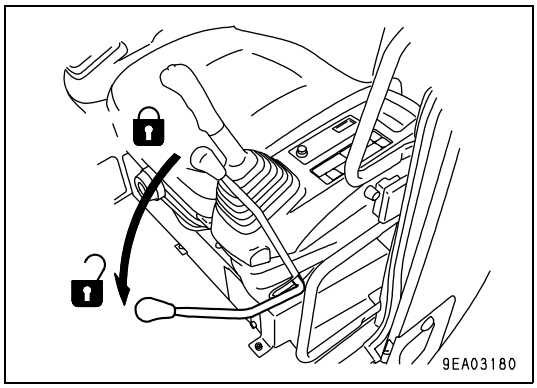
5. Lock the sliding door (see cab specifications) and the covers with lock.
6. Place blocks under both ends of the tracks to prevent the machine from moving while it is being transported. Secure the machine with sufficiently resistant chains or metal cables.
   In particular, fix the machine so that it cannot slide on one side.



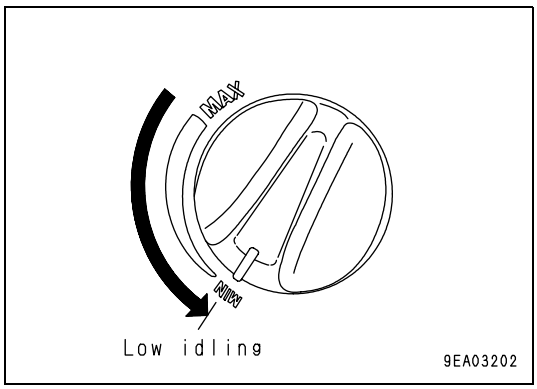
3.4.2.3 UNLOADING THE MACHINE

1. Loading and unloading operations must be carried out only on firm and level ground. Keep a safety distance from the edge of the road.
2. In particular, fix the machine so that it cannot slide on one side. Engage the trailer brakes and place blocks under the trailer wheels to prevent it from moving.
   Before getting on the ramps, make sure that the machine is in line with the ramps and that the centerline of the machine corresponds to the centerline of the trailer.
   The inclination of the ramps cannot exceed 15°.
3. Remove the chains and metal cables that fix the machine.
4. Start the engine and warm it up.
5. Release the safety lever.

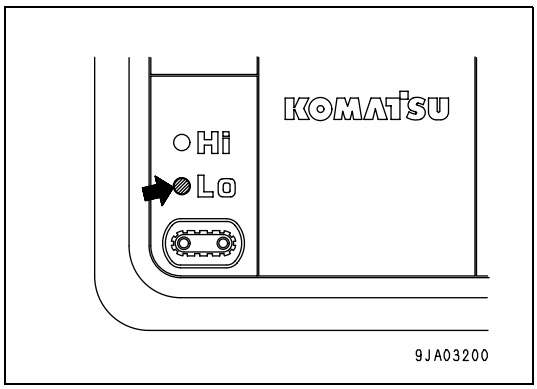




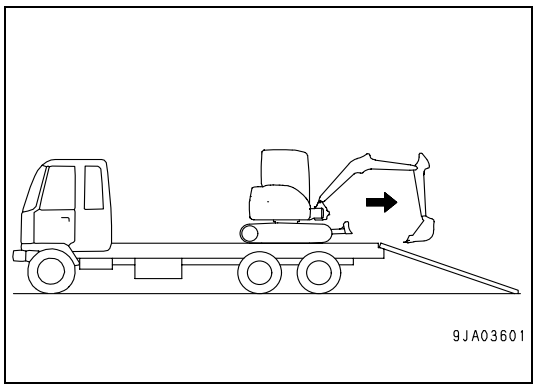
6. Run the engine at low speed.
7. Lift the blade.



8. Select the low speed using the travel speed selection switch (warning light “Lo” on).



9. Raise the work equipment, make sure that the travelling direction of the machine corresponds to the direction of the ramps, and proceed slowly.
   Lower the work equipment as much possible, avoiding any contact with the trailer.
   When the machine is on the ramps, operate only the travel levers.



3.4.3 HOW TO LIFT THE MACHINE

⚠ WARNING

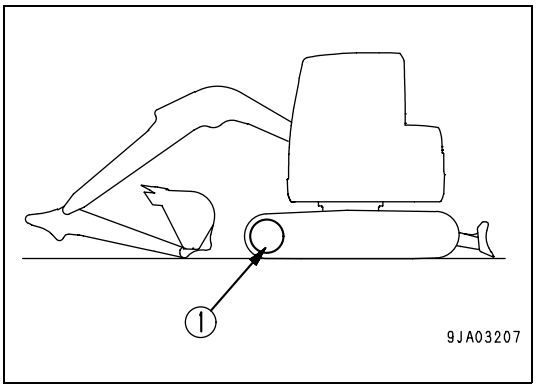
- **Do not lift the machine if the operator is still on board.**
- **Always make sure that the metal cable used to lift the machine is sufficiently strong for the weight being lifted.**
- **Do not lift the machine with the turret swung laterally. Before lifting the machine, swing the work equipment to the sprocket side, then position the undercarriage and the turret parallel to each other.**
- **Always keep the machine in horizontal position during the lifting operations.**
- **Do not stand under the machine when this is suspended.**
- **Do not attempt to lift the machine in any position different from that illustrated below, since it may lose stability.**

IMPORTANT

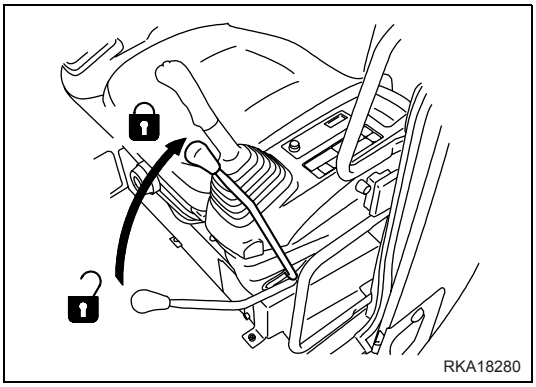
- **For details on the weight of the machine, see paragraph "5.1 TECHNICAL DATA".**
- **The lifting procedure is valid only for standard machines.**
- **The lifting method changes depending on the accessories and optional equipment installed on the machine. In these cases, contact your Komatsu Dealer, who can supply you with more precise information.**

The lifting operation must be carried out on a level surface, by proceeding as indicated below.

1. Start the engine, then swing the turret so that the work equipment is positioned on the sprocket side (1), with the undercarriage and the turret parallel to each other.
2. Extend the bucket and arm cylinders completely, then lower the work equipment to the ground, as indicated in the diagram on the right, using the boom cylinder.
3. Lower the blade to the ground.



4. Shift the safety lever to the “locked” position.

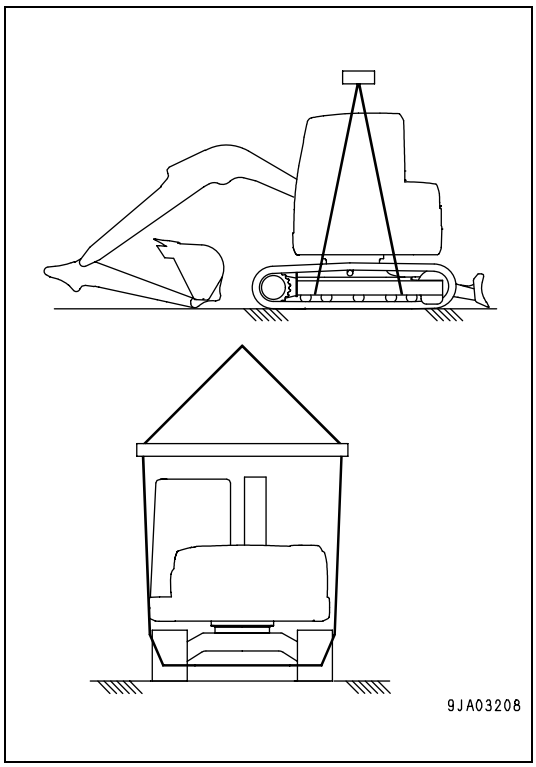


5. Stop the engine, make sure that the space around the cab is clear, then get off the machine. Close the cab door and the front window.
6. Pass the metal cables between the first and the second carrier roller starting from the front, and between the first and the second carrier roller starting from the back.

IMPORTANT

- **Do not attempt to lift the machine by attaching a metal cable to the bracket supplied to secure the machine during transport, since this procedure may damage the machine.**

7. The angle between the metal cables should range between 30° and 40°; lift the machine slowly.
8. When the machine is not in contact with the ground any longer, check the conditions of the hook and the lifting position, then lift slowly.



3.5 USING THE MACHINE IN COLD CLIMATES

3.5.1 PRECAUTIONS TO BE TAKEN WHEN USING THE MACHINE IN THE COLD SEASON

During the cold season or in areas where temperatures are particularly low, especially during the night, it is necessary to take some countermeasures meant to limit any damage deriving from low temperatures.

3.5.1.1 FUEL AND LUBRICANTS

Change fuel and oil with low viscosity products for all components. For details on the required viscosity, see "4.2 MAINTENANCE NOTES".

3.5.1.2 COOLANT

⚠ WARNING

- **Antifreeze is toxic. Avoid any contact with the eyes or the skin. In case of contact with the eyes or the skin, wash with plenty of running water and consult a doctor without delay.**
- **The coolant containing antifreeze is flammable; do not smoke and do not use naked flames during the checks and when preparing the mixture.**

1. Use only red permanent antifreeze suitable for aluminium radiators. Pure antifreeze must be diluted with water (50%) to ensure protection down to -36°C.
2. Do not mix different brands of antifreeze.
3. The use of red permanent antifreeze requires only the check of the level and the periodical change of the fluid. It is not necessary to wash the cooling circuit.
4. In case of doubt regarding the applicable standards for the use of permanent antifreeze, contact your Komatsu Dealer, who will supply you with exhaustive and precise information.

3.5.1.3 BATTERY

⚠ WARNING

- **The battery produces flammable gas, therefore keep flames and sparks away from it.**
- **The battery electrolyte is dangerous. In case of contact with the eyes or the skin, wash with plenty of running water and consult a doctor without delay.**
- **The battery electrolyte melts paint. In case of contact with the machine body, wash immediately with water.**
- **If the battery electrolyte freezes, do not charge the battery or start the engine with a different power supply, since the battery may explode.**
- **The battery electrolyte is toxic, therefore it is necessary to avoid draining it in sewage systems or contaminating the ground.**

When the ambient temperature drops, the capacity of the battery decreases accordingly. If the battery charge is low, the electrolyte may freeze. Keep the battery completely charged and protect it from low temperatures, so that the machine can be started without problems in the morning.

NOTE

- Measure the specific weight of the fluid and calculate the charge percentage according to the following conversion table.

CHARGE PERCENTAGE	TEMPERATURE			
	20°C	0°C	-10°C	-20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

- Since the capacity of the battery decreases considerably at low temperatures, cover the battery or remove it from the machine, store it in a warm place and install it again the following morning.
- If the electrolyte level is low, add distilled water in the morning before starting work. Do not add water at the end of the work day, since the fluid inside the battery may freeze during the night.

3.5.2 AT THE END OF THE WORK DAY

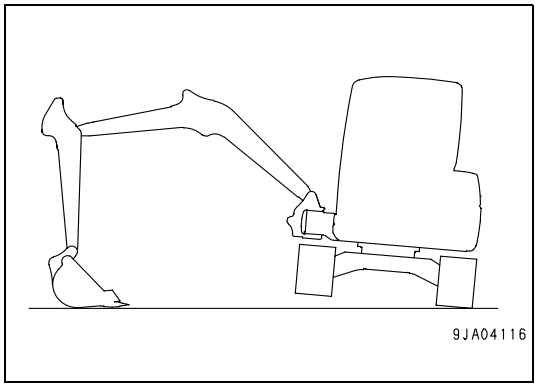
⚠ WARNING

- **Making the tracks turn idly is dangerous, therefore it is advisable to keep away from the tracks when carrying out this operation.**

To prevent the mud and water present on the undercarriage from freezing, thus making it impossible to move the machine the following morning, always take the following precautions.

- Remove any trace of mud and water from the machine body. In particular, clean the hydraulic cylinder rod to avoid damaging the gasket due to the penetration of mud or dirt present on the rod together with water drops.
- Park the machine on firm and dry ground. If this is not possible, park it on wooden boards, in order to protect the tracks and to prevent them from freezing and remaining stuck in the mud. This will make it easier to start the machine in the morning.
- Open the drain valve and drain the water accumulated in the fuel system to prevent it from freezing.
- Fill the fuel tank completely, in order to prevent the formation of condensate inside the tank when the temperature decreases.
- After working in water or mud, remove the water from the undercarriage by proceeding as indicated below, in order to extend the life of the undercarriage.

1. Swing the turret by 90° with the engine idling and bring the work equipment to the side of the tracks.
2. Lift the machine using a jack until the track is slightly raised from the ground. Make the track rotate idly. Repeat this procedure on both the left and the right side of the machine.



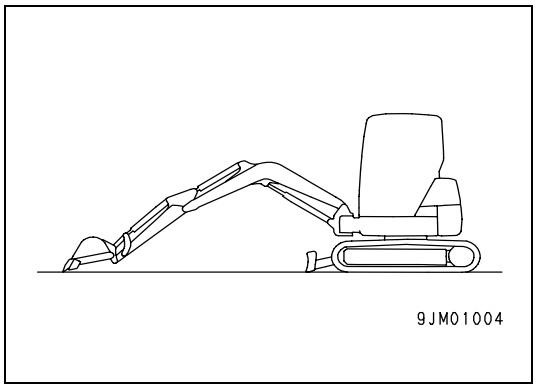
3.5.3 AT THE END OF THE COLD SEASON

At the end of the cold season, when the climate becomes warmer, proceed as follows.

- Change fuel and oil with products having suitable viscosity.
  For further details, see paragraph "4.2 MAINTENANCE NOTES".

3.6 LONG PERIODS OF INACTIVITY

3.6.1 BEFORE A PERIOD OF INACTIVITY



IMPORTANT

- **When the machine is going to remain unused, position the work equipment as shown in the diagram on the right to protect the hydraulic cylinder rod. (This serves to prevent the cylinder rod from rusting).**

If the machine is going to remain unused for a long period, proceed as indicated below.

- Wash and dry all the parts of the machine, then store it in a dry place. If it is necessary to leave the machine outdoors, park it on a level surface and cover it with a tarpaulin.
- Fill the fuel tank completely, lubricate where necessary and change the oil.
- Apply a thin film of grease on the metal surface of the hydraulic cylinder rods.
- Disconnect the negative terminals of the battery and cover it, or alternatively remove it from the machine and store it separately.
- Lock all the control levers and the pedal using the safety lever and the pedal locking device.
- If the machine is configured for the installation of attachments, set the stop valve to position “lock”. Install the blind plugs on the 90° elbows.
- If the machine can be equipped with attachments, shift the selection lever to position “Hammer or other attachments”.

3.6.2 DURING A PERIOD OF INACTIVITY

⚠ WARNING

- **If it is necessary to carry out a rust-prevention treatment while the machine is kept indoors, open doors and windows to increase ventilation and avoid poisoning by gas.**

Start the engine and move the machine for a short distance once a month, so that a new oil film covers all the moving parts and the surface of the components. Charge the battery at the same time.

- If the machine is equipped with air conditioner, switch it on.
- Make the tracks turn.

3.6.3 AFTER A PERIOD OF INACTIVITY

IMPORTANT

- **If the machine has been stored without carrying out the monthly rust-prevention treatment and it is necessary to use it, contact your Komatsu Dealer.**

Before using the machine after a long period of inactivity, carry out the operations listed below.

- Remove the grease from the hydraulic cylinder rods.
- Add oil and grease where necessary.
- When the machine is not used for a long period, the air humidity contaminates the oil. Check the oil before and after starting the engine. If there is water in the oil, change the oil.
- The fuel tank is made of plastic, therefore do not clean it using trichloroethylene-based solvents. The use of trichloroethylene may damage the tank.

3.7 TROUBLESHOOTING

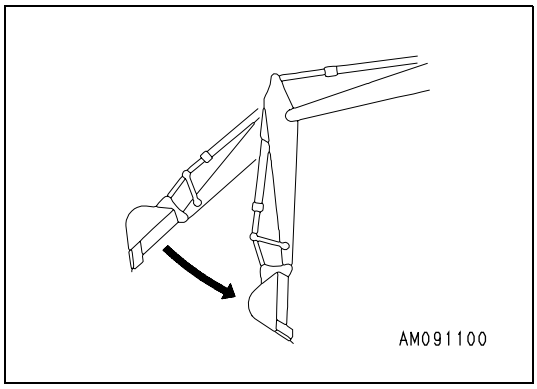
3.7.1 IF FUEL RUNS OUT COMPLETELY

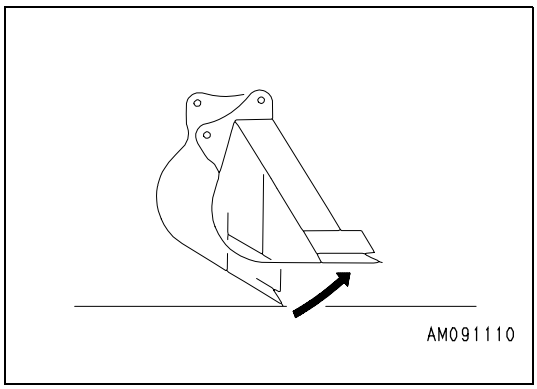
After running out of fuel, refuel and bleed the fuel system before starting the machine.
For further details on the bleeding procedure, see "4.9.9.a pos. BLEEDING THE CIRCUIT".

3.7.2 OCCURRENCES THAT ARE NOT FAILURES

Pay attention to the following occurrences, that are not considered failures:

- When the arm control lever is shifted to the folding position and the work equipment is lowered without load from a high position, the arm speed drops momentarily according to the more or less vertical position of the arm itself.
- When the bucket control lever is shifted to the folding position and the work equipment is lowered without load from a high position, the bucket speed drops momentarily according to the more or less horizontal position of the bucket teeth.
- When the swinging movement starts or ends, the brake valve emits a noise.
- When the machine travels down a steep slope at low speed, the travel motor brake valve emits a noise.



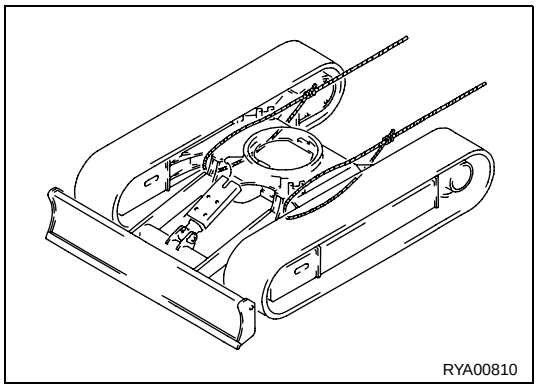


3.7.3 REMOVING THE MACHINE

⚠ WARNING

- **When removing the machine, use a metal cable suitable for the weight of the machine.**
- **Do not apply sudden loads to the metal cable.**

If the machine is stuck in mud and cannot get out using its own power, or if the traction force of the excavator is used to remove a heavy object, use a metal cable and proceed as illustrated in the diagram on the right.
Position wooden blocks between the wire cables and the machine body, in order to prevent the cables from damaging the body itself.



⚠ CAUTION

- **The maximum applicable force is 5000 kg.**

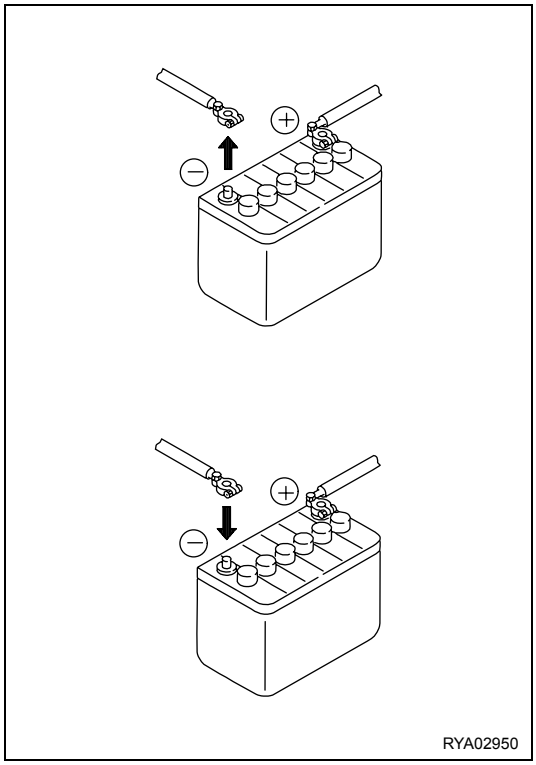
3.7.4 DEMANDING OPERATING CONDITIONS

- When carrying out digging operations with the machine immersed in water, if the water reaches the work equipmet coupling pins, lubricate them every time the machine is used.
- When carrying out deep excavations or demanding digging operations, grease the work equipment coupling pins before every single operation.
  After applying grease, operate the boom, the arm, the bucket and the blade more than once and grease again.

3.7.5 IF THE BATTERY IS DOWN

⚠ WARNING

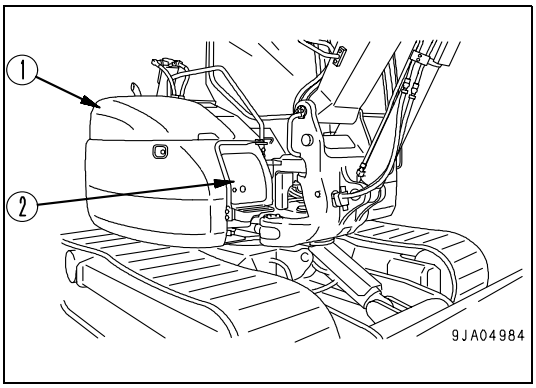
- **It is dangerous to charge the battery when it is installed in the machine. Always remove it before recharge.**
- **Before carrying out any work on the battery, stop the engine and turn the ignition key to position OFF.**
- **The battery produces hydrogen, which may explode. Do not smoke and avoid producing sparks near the battery.**
- **The battery electrolyte is made of diluted sulphuric acid that may corrode clothes and even the skin; in case of contact with this fluid, immediately rinse the involved part with plenty of water. If the acid gets into the eyes, immediately rinse with plenty of water and consult a doctor without delay.**
- **When working on the battery, always wear goggles and rubber gloves.**
- **When removing the battery, disconnect the earth cable (-) first. When installing the battery, connect the positive terminal (+) first.**
  If a tool touches the positive terminal and the frame of the machine at the same time, sparks may be generated, thus causing an explosion hazard.
- **Carefully tighten the connection terminals, since false contacts may generate sparks with consequent risk of explosion.**
- **The accumulation of oxide around the terminals causes the battery to discharge. Clean the terminals carefully and cover them with a thin film of grease before installation.**



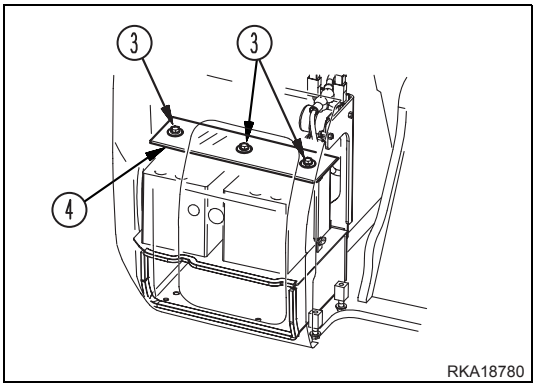
3.7.6 REMOVING AND INSTALLING THE BATTERY

REMOVAL

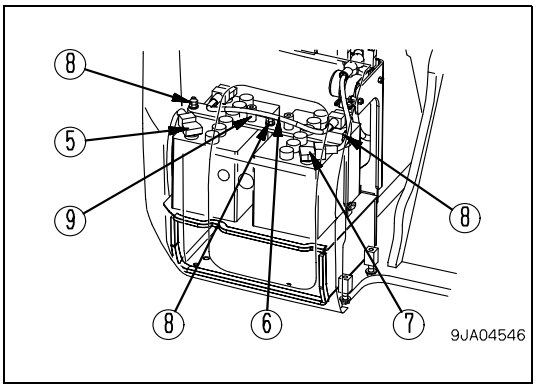
1. Open the side cover (1) and the battery inspection cover (2).



2. Loosen the bolts (3) to remove the bracket (4) positioned on the battery.



3. Disconnect first the cable (5) from the negative terminal (-) (earthing).
4. Disconnect the connection cable (6) and the cable (7) from the positive terminal (+).
5. Loosen the nuts (8) to remove the fastening devices (9).
6. Extract the battery through the inspection cover (2).



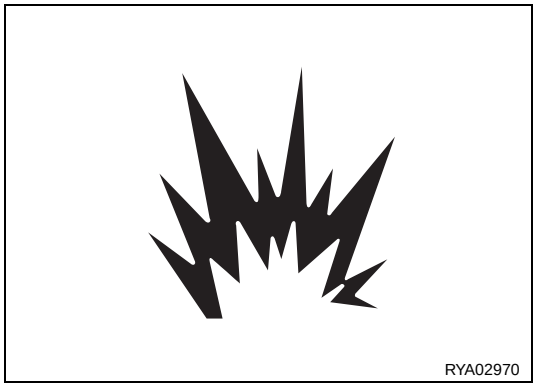
INSTALLATION

IMPORTANT

- **After securing the battery, make sure that it does not move. If it moves, fix it again.**

1. Install the battery in the specified position.
2. Secure the battery with the fastening devices (9) and the nuts (8).
3. Connect the cable (7) to the positive terminal (+) of the battery.
4. Connect first the connection cable (6) to the positive terminal (+) of the battery.
5. Connect the cable (5) to the negative terminal (-) (earthing).
6. Put back the bracket (4).
7. Close the inspection cover (2) and the side cover (1).

3.7.7 CHARGING THE BATTERY



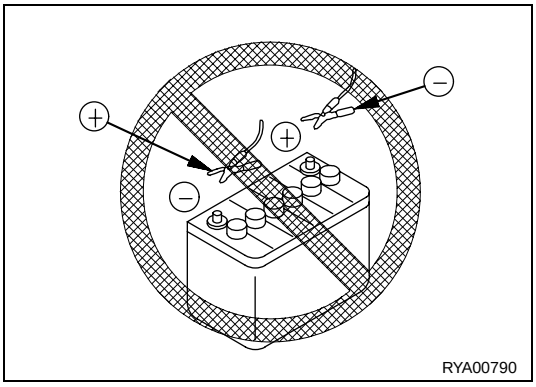
If the battery is not handled correctly during recharge, there is an explosion hazard. Always follow the instructions given in paragraph "3.7.5 IF THE BATTERY IS DOWN" and the instruction manual supplied together with the charger, and proceed as follows.

- Set the voltage of the battery charger so that it corresponds to the voltage of the battery to be charged. If the voltage is not set correctly, the battery charger may overheat and cause an explosion.
- Connect the positive clamp (+) of the battery charger to the positive terminal (+) of the battery, then connect the negative clamp (-) of the battery charger to the negative terminal (-) of the battery. Make sure that the clamps are secured firmly.
- Set the recharge current at 1/10 of the value of the rated capacity of the battery; in case of a quick recharge, set it to a lower value than the rated capacity of the battery. If the recharge current is too high, the electrolyte may flow out or dry up and this may cause the battery to ignite and explode.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power supply. This may lead to the ignition of the electrolyte and the explosion of the battery.
- Do not use or charge the battery if the electrolyte level is below the MINIMUM mark. This may cause an explosion. Check the electrolyte level periodically and top up with distilled water until reaching the MAX. reference mark.

3.7.8 STARTING WITH BOOSTER CABLES

When starting the engine with booster cables, proceed as indicated below.

3.7.8.1 CONNECTING AND DISCONNECTING THE BOOSTER CABLES



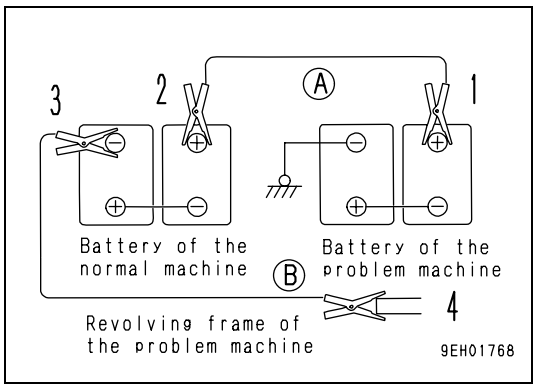
⚠ WARNING

- **When connecting the cables, avoid any contact between the positive cable (+) and the negative cable (–).**
- **When starting the engine with a booster cable, always wear safety goggles.**
- **Take care to prevent any contact between the failed machine and the machine used as starting aid, in order to avoid generating sparks near the battery. In fact, sparks may cause the explosion of the hydrogen produced by the batteries and lead to serious damage.**
- **Take care not to make any mistake when connecting booster cables. In the last connection (to the turret frame) a spark is generated, therefore it is advisable to connect the cable as far from the battery as possible. (In any case, avoid the attachments, since they are poor conductors).**
- **When disconnecting a booster cable, take care to avoid any contact of the clamps with each other or with the machine frame.**

IMPORTANT

- **The booster cable and the clamps must be sized according to the dimensions of the battery.**
- **The battery to be used as starting aid must have the same capacity as the battery of the failed machine.**
- **The starting system of this machine is powered at 24 V. Therefore, use a 24V battery for the machine to be used as power source.**
- **Make sure that cables and clamps are neither corroded, nor damaged.**
- **Make sure that cables and clamps are secured firmly.**
- **Make sure that the safety levers and the parking brake levers of both machines are in position “lock”.**
- **Make sure that all the levers are in neutral.**

3.7.8.2 CONNECTING THE BOOSTER CABLES



Keep the ignition switches of both machines in position OFF.
Connect the booster cable proceeding as indicated below, respecting the numerical order indicated in the diagram.

1. Connect one clamp of the booster cable (A) to the positive (+) terminal of the machine to be started.
2. Connect the other clamp of the booster cable (A) to the positive (+) terminal of the machine used as starting aid.
3. Connect a clamp of the booster cable (B) to the negative (+) terminal of the machine used as starting aid.
4. Connect the other clamp of the booster cable (B) to the turret of the machine to be started.

3.7.8.3 STARTING THE ENGINE

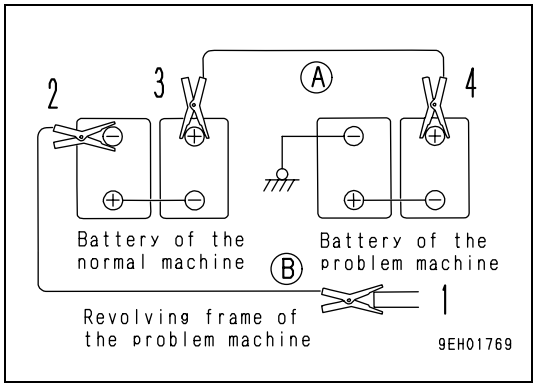
WARNING

- **Before starting the engine, make sure that the safety lever is in position "LOCK". If one of the work equipment control levers is inadvertently touched during the starting phase, the work equipment may move abruptly and cause serious damage or even injury.**

1. Make sure that the clamps are correctly connected to the battery terminals.
2. Start the engine of the machine used as starting aid and let it run at maximum rpm.
3. Turn the ignition switch of the failed machine to position START and start the engine.

If the engine cannot be started at the first attempt, try again after approximately 2 minutes.

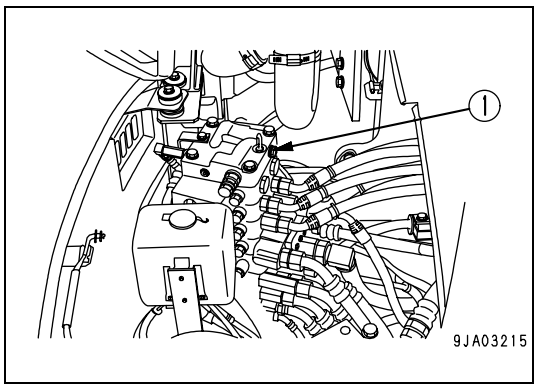
3.7.8.4 CONNECTING THE BOOSTER CABLES



After starting the engine, disconnect the booster cables proceeding in the reverse order.

1. Disconnect one clamp of the booster cable (B) from the turret of the machine that has been started.
2. Disconnect the other clamp of the booster cable (B) from the negative (-) terminal of the machine used as starting aid.
3. Disconnect one clamp of the booster cable (A) from the positive (+) terminal of the machine used as starting aid.
4. Disconnect the other clamp of the booster cable (A) from the positive (+) terminal of the machine that has been started.

3.7.9 LOWERING THE WORK EQUIPMENT WHEN THE ENGINE STOPS BECAUSE OF A FAILURE



⚠ CAUTION

- **This procedure should be carried out only in case of breakage or if the battery is down.**

⚠ WARNING

- **Before loosening the cap, make sure that everything is in order under the work equipment and the blade.**
- **Do not allow anyone to go under the work equipment or the blade.**
- **While the work equipment is being lowered, keep holding the cap with a suitable tool, in such a way as to be able to interrupt the descent of the equipment at any moment.**

If it becomes impossible to lower the work equipment, proceed as indicated below.

1. Open the side cover.

IMPORTANT

- **Do not loosen the cap with more than 5 turns. Otherwise, the cap comes off and the hydraulic oil is sprayed out.**

2. Slowly loosen the cap (1) of the main valve to lower the work equipment. Loosen the cap giving approx. 3.5-4 turns.
3. When the work equipment has been lowered to the ground,,tighten the cap (1).
   Driving torque: from 34 to 44 Nm (from 3.5 to 4.5 kgfm).

3.7.10 OTHER TROUBLES

(•) : Always contact your Komatsu Dealer when you have to carry out this operation.

• : In case of anomalies or problems that are not listed here below, contact your Komatsu Dealer, who will provide for the necessary repairs.

3.7.10.1 ELECTRICAL SYSTEM

TROUBLE	MAIN CAUSES	SOLUTION
Lights do not work satisfactorily even with engine running at high speed.	• Faulty cables. • Faulty fan belt tension.	(•) Check and repair any loose terminals and connections. • Adjust fan belt tension. For details, see “EVERY 250 HOURS OF OPERATION”
Lights come on intermittently with engine running.		
Battery charge warning light does not go out even with engine running.	• Faulty alternator. • Faulty cables.	(•) Change. (•) Check and repair.
Alternator emits abnormal noise.	• Faulty alternator.	(•) Change.
Starter does not turn with key in position START.	• Faulty cables. • Battery charge insufficient.	(•) Check and repair. • Charge
Starter pinion engages and disengages repeatedly.	• Battery charge insufficient.	• Charge
Starter makes engine run slowly.	• Battery charge insufficient. • Faulty starter.	• Charge (•) Change.
Starter disengages before engine start.	• Faulty cables. • Battery charge insufficient.	(•) Check and repair. • Charge
Preheating warning light does not come on.	• Faulty cables. • Faulty warning light.	(•) Check and repair. (•) Change.
Engine oil pressure warning light does not come on when engine stops (ignition switch in position ON).	• Faulty warning light. • Faulty oil pressure sensor.	(•) Change. (•) Change.
With deceleration warning light off, hand accelerator does not work.	• Faulty relay. • Faulty deceleration device. • Faulty controller.	(•) Change. (•) Change. (•) Change.
The engine speed does not decrease, or increases even after the deceleration switch has been pressed.	• Faulty cables. • Blown fuse	(•) Check and repair. (•) Check and repair.

3.7.10.2 FRAME

TROUBLE	MAIN CAUSES	SOLUTION
Travel speed, swing speed, boom, arm and bucket speed are low.	• Hydraulic oil too low.	• Top up oil until reaching correct level, see “CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE”.
Pump emits an abnormal noise.	• Clogged filter in hydraulic tank.	• Clean, see “EVERY 5000 HOURS OF OPERATION”.
Hydraulic oil temperature increases excessively.	• Fan belt slack. • Hydraulic oil too low.	• Adjust fan belt tension, see “EVERY 250 HOURS OF OPERATION”. • Top up oil until reaching correct level, see “CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE”.
Tracks come off.	• Tracks excessively slack.	• Adjust the track tension, see “WHEN REQUIRED”.
Sprocket abnormally worn out.		
Bucket can only be lifted slowly or cannot be lifted.	• Hydraulic oil too low.	• Top up oil until reaching correct level, see “CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE”.
Engine speed does not change, not even using hand accelerator.	• Quick deceleration switch in position ON.	• Press quick deceleration switch, making sure that the corresponding warning light goes out.

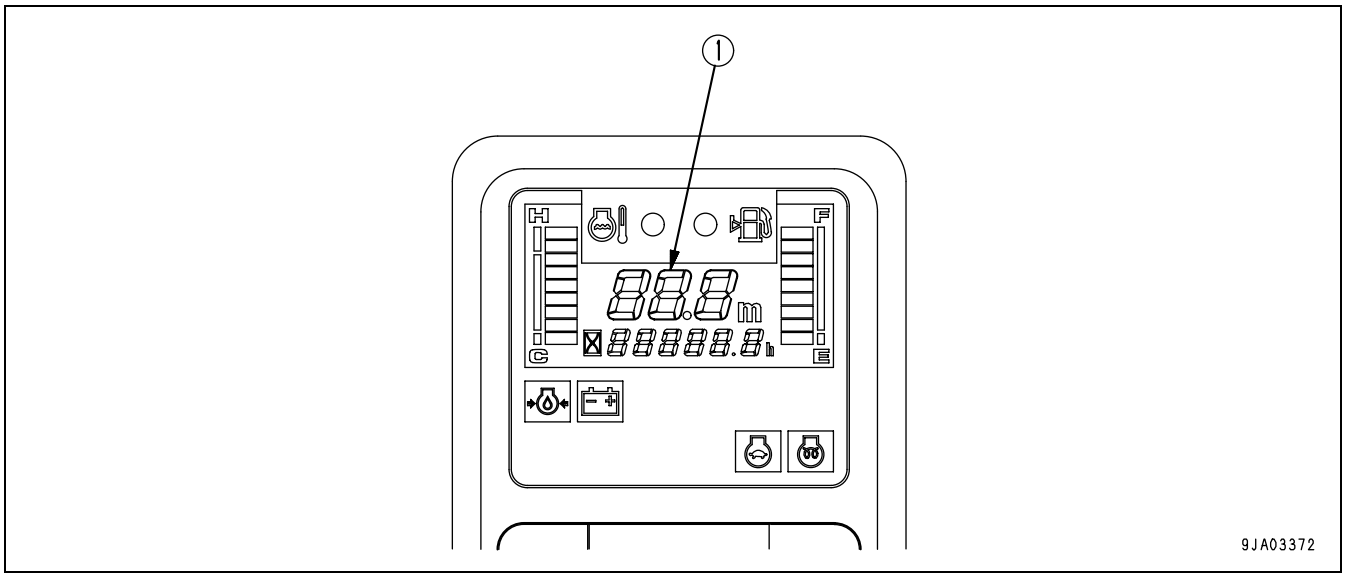
3.7.10.3 ENGINE

TROUBLE	MAIN CAUSES	SOLUTION
Engine oil pressure warning light comes on.	• Oil level in oil pan too low (air sucked in).	• Top up oil until reaching correct level, see “CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE”.
	• Oil filter cartridge clogged.	• Change cartridge, see “EVERY 500 HOURS OF OPERATION”.
	• Faulty tightening of oil pipe or pipe coupling, oil leakage from a defective point.	(•) Check and repair.
	• Faulty warning light.	(•) Change.
Steam comes out of radiator (pressure valve).	• Engine coolant level low, coolant leakage.	• Check, top up, repair, see "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
	• Fan belt slack.	• Adjust fan belt tension, see “EVERY 250 HOURS OF OPERATION”.
Red area of engine coolant temperature indicator lights up.	• Mud or limestone accumulated in cooling system.	• Change fluid and clean cooling system, see “WHEN REQUIRED”.
	• Radiator fins damaged or closed.	• Clean or repair, see “EVERY 500 HOURS OF OPERATION”.
	• Faulty thermostat.	(•) Change thermostat.
	• Radiator cap loose (work at considerable heights).	• Tighten cap or change gasket.
	• Faulty coolant level sensor.	(•) Change sensor.
White area of engine coolant temperature indicator lights up even after several hours of operation.	• Faulty thermostat.	(•) Change thermostat.
Engine does not start with starter running.	• Fuel level too low.	• Refuel, see "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
	• Air in the fuel system.	• Repair point where air is sucked in, see "EVERY 500 HOURS OF OPERATION".
	• Pump or fuel injection nozzle faulty.	(•) Change pump or nozzle.
	• Starter makes engine run slowly.	• See "ELECTRICAL SYSTEM".
	• Preheating warning light does not come on.	• See "ELECTRICAL SYSTEM".
	• Faulty compression.	
	• Excessive valve clearance.	(•) Adjust valve clearance.
Exhaust gases white or light blue.	• Too much oil in oil pan.	• Add oil up to specified level, see “CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE”.
	• Unsuitable fuel.	• Change with fuel in compliance with standards.
	• Quick acceleration soon after cold start of the engine.	• Avoid quick accelerations until engine has warmed up.

TROUBLE	MAIN CAUSES	SOLUTION
Exhaust gases occasionally become black.	• Air filter clogged. • Faulty nozzle. • Faulty compression.	• Clean or replace, see “WHEN REQUIRED”. (•) Change nozzle. (•) See “Faulty compression”.
Combustion noise occasionally resembles a blow.	• Faulty nozzle.	(•) Change nozzle.
Abnormal noises (during combustion or in mechanical parts).	• Fuel with low cetane rating. • Overheating. • Inside of exhaust silencer damaged. • Excessive valve clearance.	• Change with fuel in compliance with standards. • See “Red area of engine coolant temperature indicator lights up”. • Change exhaust silencer. (•) Adjust valve clearance.
Engine stops during operation.	• Fuel pump prefilter clogged. • Faulty engine and fuel pipe.	• Change filter cartridge. (•) Check and repair.

3.7.10.4 ELECTRONIC CONTROL SYSTEM

If an error code appears on the display of the machine (1) (it normally displays the time), adopt the counteractions described in the following self-diagnostics table.



Machine monitoring system

Display	Error type	Counteraction
E02	Pump control system error	If the pump system deactivation emergency switch is in position ON, it is possible to work. In any case, have the system checked immediately by a Komatsu Dealer. (*)
E03	Swing brake system error	Turn the swing brake exclusion switch to position ON to release the brake. Depending on the cause of the failure, it may be possible to release the brake. In any case, have the system checked immediately by a Komatsu Dealer. (*)
E41	Boom swing system error	If the boom and turret swing brake deactivation emergency switch is in position ON, it is possible to work. In any case, have the system checked immediately by a Komatsu Dealer. (*)
E05	Governor system error	The hand accelerator does not work. The acceleration or deceleration function, or both, is/are not working, depending on the type of failure. In any case, have the system checked immediately by our technical assistance dpt.
Have the machine checked immediately by a Komatsu Dealer.		Have the machine checked immediately by a Komatsu Dealer.

(*): for details on how to use the pump system deactivation emergency switch and the boom and turret swing brake deactivation emergency switch, see pos. 3.2.2 SWITCHES AND PUSH BUTTONS".

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MAINTENANCE

4.1 GUIDE TO MAINTENANCE

⚠ WARNING

- **Oils, filters, coolant, gaskets, electric cables, and batteries are considered special waste and must be collected and disposed of according to the anti-pollution regulations in force.**
- **The combustible material of some components may become extremely dangerous if it burns. For this reason, avoid any contact of burnt material with your skin or eyes and do not inhale its fumes.**

- Do not carry out any inspection or maintenance operation not prescribed in this manual.
- Check the hour meter every day to verify if it is necessary to carry out any maintenance operation.
- Before opening the engine hood, engage all the safety locks and stop the engine.
- If it is necessary to check the hydraulic oil level, retract the bucket and arm cylinders completely and lower the bucket teeth to the ground.
- Carry out these operations on firm and level ground.
- Use Komatsu genuine oils and greases; choose oils suitable for the ambient temperature.
- Use clean oils and greases. Keep the oil and grease containers clean and prevent any foreign matter from getting into them.
- Keep the machine thoroughly clean; this facilitates troubleshooting. In particular, grease nozzles, breather holes, and the areas where fluid levels are checked should be kept clean to prevent the infiltration of impurities.
- Draining water or oil, and changing filters soon after work is dangerous; wait for the engine to cool down to a safe temperature of 40÷45°C.
  If it is necessary to drain the oil when it is cold, warm it up to a suitable temperature (approximately 20÷40°C) before draining it.
- When changing oils or filters, check if metal particles are present. If there are large quantities of metal particles, contact your Komatsu Dealer.
- If the machine is provided with a fuel filter in the filler neck, do not remove it while refuelling.
- Check and change the oil in a clean place and prevent any impurity from getting into the tank.
- Before carrying out any maintenance operation, hang a warning plate to the ignition switch and the control levers to prevent anyone from starting the engine.
- When performing maintenance operations, always take the precautions indicated in the safety plates applied to the machine.
- Instructions for arc welding:

1 - Turn the ignition key to position OFF.
2 - Disconnect the battery (first the negative pole and then the positive pole).
3 - Disconnect the alternator.
4 - Do not apply more than 200V continuously.
5 - Connect the earth cable within 1 m from the point where the welding operation must be carried out.
6 - Avoid placing gaskets and bearings between the welding area and the earth cable. If the earth cable is connected near instruments, connectors, etc., these may not function correctly.
7 - Do not use the area around the work equipment pins or the hydraulic cylinders as earth.

- Do not use flammable fluids to clean any parts of the machine.
- Keep naked flames away from these fluids and avoid smoking. When O rings and gaskets are removed, clean the sealing surfaces thoroughly and replace the O rings and gaskets with new ones.
  Fit the O rings and gaskets correctly when reassembling.
- Avoid keeping loose objects or tools in your pockets: they may fall out and drop into the machine, especially when you open covers and work on the machine while bending over it.

- When working on rocky areas, make sure that the undercarriage is not damaged and that there are no breakages, damages, worn parts, or loose or damaged nuts or bolts.
- When washing the machine, do not direct the high-pressure water jet onto the radiator.
- When washing the machine, protect the electric system connectors and avoid wetting the ignition switch.
- The fuel tank is made of plastic, therefore avoid using trichloroethylene to clean it. Trichloroethylene reduces the resistance and duration of the tank.
- Before starting work on muddy ground, under rain or snow, on seashores or river banks,, check the tightening of valves and caps. Wash the machine immediately after work, in order to prevent its components from rusting Make sure that there are no damages, missing or loose nuts or pins.
  Lubricate the components more frequently than usual. Lubricate the pins of the work equipment carefully every day, if during work they are immersed in water.
- When the work site is particularly dusty, proceed as follows:

1 - Check the air filter for clogging and clean it more frequently than usual.

2 - Clean the radiator frequently in order to prevent the fins from clogging.

3 - Change the diesel oil filter more frequently than usual.

4 - Clean the electrical components, especially the starter and the alternator, to avoid any accumulation of dust.

- Do not mix oils of different brands. Do not top up with oils different from those being used. If you cannot use the same oil, drain the tank and change the oil completely.

4.2 MAINTENANCE NOTES

- Use only Komatsu genuine spare parts.
- Do not mix different types of oil.
- Unless specified otherwise, the oils and the coolant used by Komatsu to fill the tanks before the delivery of the machine are the following:

ITEM / TANK / SYSTEM	SPECIFICATIONS
• Engine oil	SAE 10W-30 Specifications: API CF - CF2 - CD
• Hydraulic system oil	SAE 30 Specifications: API CD
• Biodegradable hydraulic system oil ((Only for machines in which synthetic biodegradable oil type HEES not of plant origin is used)	SHELL NATURELLE HFX-32
• Swing reduction gear oil	SAE -90 Specifications: API GL5
• Travel reduction gears oil	SAE -90 Specifications: API GL5
• Fuel	With ambient temperature over -10° C, use: Diesel oil ASTM D975 N°2
	With ambient temperature below -10°C, use: Diesel oil ASTM D975 N°1
• Radiator	Special permanent antifreeze, biodegradable, ethylene glycol based with corrosion inhibitor and with no silicates, borates, nitrates, phosphates and amines. Red antifreeze suitable for aluminium radiators, diluted with water (50%) to ensure protection down to -36°C.

4.2.1 OIL, FUEL AND COOLANT

4.2.1.1 OIL

- The oil used for the engine and the work equipment is subjected to demanding conditions (high temperature, high pressure) and deteriorates with use. Always use oil suitable for the characteristics and temperatures indicated in the use and maintenance manual. Change the oil after the prescribed interval, even if it is not dirty.
- The engine oil must be selected very carefully, since it lubricates the engine, which is the machine's heart; the main maintenance operations required for the engine oil are the following:

1. daily check of the oil level;
2. check of the degree of pollution of the oil;
3. periodical change.

- When changing the oil, change also the filters.
- It is advisable to have the oil periodically analysed in order to check the conditions of the machine. The analysis must be carried out by specialized personnel at Komatsu Dealers.

4.2.1.2 FUEL

- Always use fuel suitable for the engine. Other fuels with different specifications may damage the engine or reduce its power.
- Always refuel at the end of the workday.
- When refuelling, make sure that there is no water on the fuel drum cover and take care not to draw condensate from the drum bottom.
- If fuel runs out, or if the fuel filter has been replaced, it is necessary to bleed the circuit.

4.2.1.3 COOLANT

- The coolant serves to keep the engine at the correct temperature and therefore to ensure optimal operating conditions; check the coolant level in the expansion tank daily and top up when necessary.
- The coolant containing antifreeze is flammable; do not use naked flames near the coolant and do not smoke while topping up.
- Use only red permanent ethylene glycol based antifreeze, with corrosion inhibitors and antifoam products, suitable for aluminium radiators. If pure, dilute with water (50%).
- The use of permanent antifreeze requires only the check of the level and the periodical change of the fluid. It is not necessary to wash the cooling circuit.
- Use drinkable water and in any case soft water.
- Do not use corrosion inhibitors containing soluble oil, since they damage the rubber couplings.
- In case of doubt regarding the applicable standards for the use of coolant, contact your Komatsu Dealer, who will supply you with exhaustive and precise information.

4.2.1.4 KOWA (KOMATSU OIL WEAR ANALYSIS)

This system requires that oil samples be periodically collected and analysed. This is a preventive maintenance service, which makes it possible to identify faulty parts or worn machine components timely. It also allows many failures to be prevented and machine downtime to be reduced.

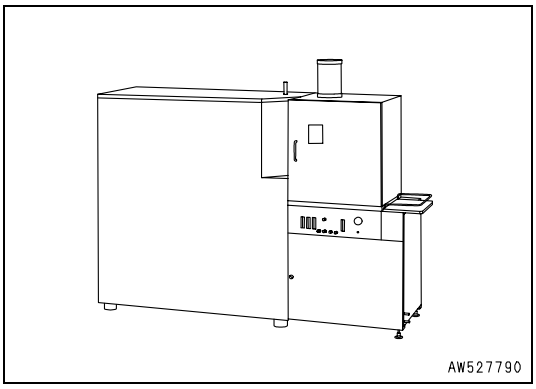
Many years of experience and the availability of countless data and information allow Komatsu to accurately determine the conditions of the machine. This also allows us to locate troubles and suggest the most suitable and fast repair solutions.

The customer immediately receives a report containing the results of the analysis and suggestions for the operations to be carried out. This low-cost service is very useful and allows customers to save money and avoid many problems.

KOWA ANALYSIS STAGES

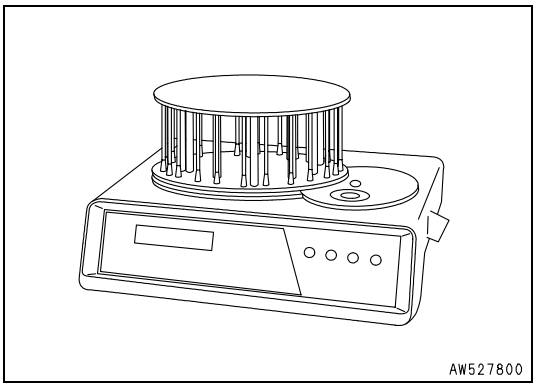
Analysis of metal particles

In this stage a ICP (Inductively Coupled Plasma) analyser is used to measure the density of the metal particles present in the oil.



Measurement of particle quantity

In this stage a PQI (Particle Quantifier Index) machine is used to measure the quantity of large iron particles present in the oil.



Other analyses and measurements

In this stage other aspects, such as the percentage of water or fuel in the oil and the dynamic viscosity, are analysed.

OIL SAMPLING

- Collection interval
  Every 500 hours: engine and other components
- Precautions to be taken when sampling the oil
  - Make sure that the oil is well mixed before sampling.
  - Carry out sampling regularly, at fixed intervals.
  - Do not carry out sampling on rainy or windy days, when water or dust can get into the oil.

For further details on KOWA, please contact your Komatsu Dealer.

4.2.1.5 STORING OIL AND FUEL

- Keep oil and fuel indoors to prevent any water, dirt, or other impurities from getting into them.
- When storing drums for a long period, position them on one side, so that the opening is lateral. This prevents moisture from being sucked in through the drum filling opening.
  If drums have to be stored outside, cover them with a waterproof sheet or take other measures to protect them.
- To prevent any change in quality during long-term storage, be sure to use the fluids following the first in - first out (use the oldest oil or fuel first) method.

4.2.1.6 FILTERS

- Filters are very important components for safety. They prevent any impurities from getting into the oil, fuel, or in the air circuits, thus avoiding problems to important components of the machine.
  Periodically change all the filters. For further information, see the relevant Use and Maintenance manual.
  However, when working in extreme conditions, it is necessary to change the filters more frequently, depending on the type of oil and fuel used (sulphur content).
- Do not attempt to clean the filters (type with cartridge) and reuse them. Always change them with new filters.
- When changing the oil filters, check if metal particles are present. If you find large quantities of metal particles, contact your Komatsu Dealer.
- Do not open the spare filter packages before using them.
- Always use Komatsu original spare parts.

4.2.2 NOTES ON THE MAINTENANCE OF THE ELECTRICAL SYSTEM

- If the cables are wet or their insulating material is damaged, the electrical system leaks and this may result in malfunctions of the machine.
- The maintenance operations required for the electrical system are the following:

1 - Check of the alternator belt tension.
2 - Check of the alternator belt for damage or breakages.
3 - Check of the battery charge level.

- Do not remove or eliminate any electric component installed on the machine and do not install any electric component with characteristics different from those specified and approved by Komatsu.
- Keep the electric system dry.
- When working on the seashore or on river or lake banks, protect the jack plugs from corrosion.
- Do not connect any optional device to the fuses, ignition switch, battery, relays, etc.; for the installation of any optional equipment, contact your Komatsu Dealer.
- If any electric welding operation has to be carried out, disconnect the battery and the alternator.

4.2.3 NOTES ON THE MAINTENANCE OF THE HYDRAULIC SYSTEM

- Be extremely careful when performing maintenance operations on the hydraulic system, since soon after work the oil is very hot. The circuit is pressurized not only during work, but also at the end of work.
- The maintenance operations required for the hydraulic system are the following:

1 - Daily check of the oil level in the tank.
2 - Periodical change of the oil filter.
3 - Periodical change of the oil and cleaning of the intake filter.

- Always bleed the circuit after changing the oil filter or the oil.
- When a component is removed from the circuit, check the gaskets and O rings and change them if they are damaged.
- When a cylinder or a component of the hydraulic circuit is removed, after reassembly bleed the circuit by proceeding as follows:

1 - Start the engine and let it idle.
2 - Extend all the cylinders 4-5 times, stopping them at approx. 100 mm from the end of stroke.
3 - Slowly make all the cylinders reach the end of stroke for 3-4 times.

4.2.4 MAINTENANCE NOTES REGARDING LUBRICATION

- Lubrication makes the operations carried out with the machine and work equipment smoother, while preventing wear and the noise that may be produced if the joints are dry.
  Lubricate with grease or oil.
- The maintenance operations required for the components that need lubricating are the following:

1 - Check of the levels.
2 - Oil change.
3 - Injection of grease through the grease nipples.

- Use only the specified lubricants, according to the ambient temperature.
- Always clean the grease nipples before injecting grease and remove any excess grease after lubrication; this cleaning operation must be performed with extreme care on the revolving parts.
- Maintain correct lubricant levels, avoiding excessive or insufficient quantities.

4.3 PARTS SUBJECT TO WEAR

The parts subject to wear like filters, bucket teeth, etc. must be changed when periodical maintenance is carried out or when they reach the wear limits.
The timely change of these parts ensures an economic use of the machine.
Use only Komatsu genuine parts, which alone can guarantee excellent quality and interchangeability.

Due to our constant efforts aimed at improving product quality, the spare parts codes may be changed, therefore when ordering spare parts it is advisable to indicate also the machine serial number to the Komatsu Dealer, in order to receive the most updated version of the component required.

4.3.1 LIST OF THE PARTS SUBJECT TO WEAR

The parts between parenthesis must be replaced at the same time.

Part	Code	Description	Qty	Change interval
Engine oil filter	600-211-2110	Cartridge	1	EVERY 500 HOURS OF OPERATION
Fuel filter	600-311-2110	Cartridge	1	EVERY 500 HOURS OF OPERATION
Hydraulic oil filter	22E-60-12212 (22E-60-11250)	Cartridge (O ring)	1 (1)	EVERY 500 HOURS OF OPERATION
Water separator	21W-04-41480	Cartridge	1	WHEN REQUIRED
Air filter	21W-01-R9250 21W-01-R9260	Main filtering element Safety cartridge	1 1	WHEN REQUIRED
Work equipment line hydraulic oil filter (if installed)	201-973-7480	Cartridge	1	WHEN REQUIRED
Bucket	226-70-11410 226-70-11420 226-70-11430 226-70-11440	Bit holder Bit Pin Ring	AR AR AR AR	- - - -

4.4 FUEL, COOLANT AND LUBRICANTS

ITEM / TANK / SYSTEM	FLUID	AMBIENT TEMPERATURE -30 -20 -10 0 10 20 30 40 50°C -22 -4 14 32 50 68 86 104 122°F	CAPACITY (l)	
			1st filling	Change
Engine oil pan	OIL API CD	SAE 30 SAE 10W SAE 10W-30 SAE 15W-40	10,5	10,5
Swing reduction gear	OIL API GL5	SAE 85W-90	3,0	3,0
Travel reduction gears			1,3	1,3
Hydraulic system	OIL API CD	SAE 10W SAE 10W-30 SAE 15W-40	110	64
Hydraulic system with biodegradable oil	• See par. “4.4.1”		110	64
Fuel tank	DIESEL OIL	★✕ ASTM D975 N. 2	125	—
Engine cooling system	PERMANENT COOLANT (★★)		18	18
Articulation greasing	GREASE	Lithium EP+MoS2 (NLGI 2)		
Pinion/ball-bearing ring greasing		Lithium EP (NLGI 2)		

★ ASTM D975 N. 1

★★Special permanent antifreeze, biodegradable, ethylene glycol based with corrosion inhibitor and with no silicates, borates, nitrates, phosphates and amines.
Red antifreeze suitable for aluminium radiators, diluted with water (50%) to ensure protection down to -36°C.

IMPORTANT

- **When the diesel sulphur content is less than 0,5%, change the engine oil according to the periodic maintenance intervals indicated in the operation and maintenance manual. If the sulphur content exceeds 0.5%, change the engine oil according to the following table:**

Sulphur content	Engine oil change interval
from 0.5 to 1.0%	1/2 of regular interval
over 1.0%	1/4 of regular interval

- It is advisable to use only engine oil with API CF - CF2 - CD classification in order to ensure the correct operation and constant reliability of the engine.
- Use Komatsu genuine products whose characteristics have been specifically formulated and approved for use in the engine, in the work equipment hydraulic circuit, and in the reduction gears.

First filling quantity: total quantity of oil, including the oil for the components and pipes.

Oil change quantity: quantity of oil necessary to fill the system or unit during the normal inspection and maintenance operations.

ASTM: American Society of Testing and Materials
SAE: Society of Automotive Engineers
API: American Petroleum Institute
NLGI: National Lubricant Grease Institute

4.4.1 APPROVED SYNTHETIC BIODEGRADABLE LUBRICANTS TYPE HEES

Our machines can be filled with synthetic biodegradable hydraulic oil type HEES not of plant origin and therefore the use of the oils indicated in the following table is authorized and recommended:

SUPPLIER	SYNTHETIC BIODEGRADABLE OIL TYPE “HEES”
KOMATSU	BO 46 G4 (KES 07.872)
AGIP	—
ARAL	—
AVIA	—
BP	—
CONDAT	CONDAT D 46 K
ELF	—
ESSO	—
FINA	BIOHYDRAN SE 46
FUCHS	—
KENDALL	—
KUWAIT PETROLEUM K8	—
MOBIL	EAL SYNDRAULIC
MOBIL (USA)	—
PAKELO	—
PANOLIN	HLP SYNTH 46
SHELL	NATURELLE HFX-32
TAMOIL	—
TEXACO	—
TOTAL	HYDROBIO 46
VALVOLINE	—

⚠ CAUTION

- **It is not possible to mix the synthetic biodegradable oil type HEES with ordinary hydraulic oils, since when the temperature increases insoluble compounds are generated, which deposit on the filters and clog them (the maximum concentration of ordinary oil must not exceed 1% of the total quantity of oil).**
- **Biodegradable oil can be used only in the hydraulic system; it cannot be used for the engine, the transmissions, the braking system, etc.**
- **Before introducing biodegradable oil in the hydraulic system, drain the system completely, disconnecting the cylinders and all the parts that may contain traditional oil, then change the drain filter with a new one.**
  Start the engine and let it idle before using the equipment, wait for the engine temperature to reach at least 40°C, then start moving the equipment to fill all the circuits with oil. Stop the engine and check the oil level (see "3.3.1 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE" - "3.3.2.4 CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP").

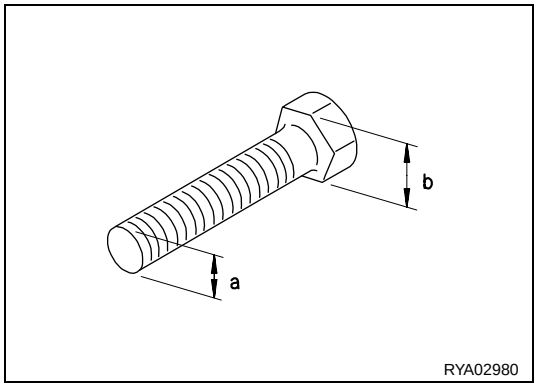
4.5 TIGHTENING TORQUES

4.5.1 STANDARD TIGHTENING TORQUES FOR SCREWS AND NUTS

⚠ CAUTION

- **If screws, nuts or other parts are not tightened with the required torque, they may become loose or damage the components with which they cooperate, and this may cause machine failures or operation problems. Always pay the utmost attention when carrying out tightening operations.**

If not specified otherwise, tighten the screws and nuts applying the torques specified in the table.
If it is necessary to replace a screw or a nut, always use Komatsu original spare parts having the same size of the part to be replaced.



★ Nm (Newton metre): 1 Nm = 0.102 kgm

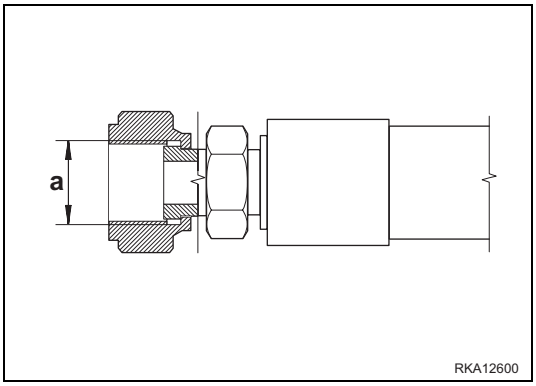
Thread diameter (a) (mm)	Pitch (mm)	Wrench size (b) (mm)	8.8		10.9	
			kgm	Nm	kgm	Nm
6	1	10	0,96 ± 0,1	9,5 ± 1	1,3 ± 0,15	13,5 ± 1,5
8	1,25	13	2,3 ± 0,2	23 ± 2	3,2 ± 0,3	32,2 ± 3,5
10	1,5	17	4,6 ± 0,5	45 ± 4,9	6,5 ± 0,6	63 ± 6,5
12	1,75	19	7,8 ± 0,8	77 ± 8	11 ± 1	108 ± 11
14	2	22	12,5 ± 1	122 ± 13	17,5 ± 2	172 ± 18
16	2	24	19,5 ± 2	191 ± 21	27 ± 3	268 ± 29
18	2,5	27	27 ± 3	262 ± 28	37 ± 4	366 ± 36
20	2,5	30	38 ± 4	372 ± 40	53 ± 6	524 ± 57
22	2,5	32	52 ± 6	511 ± 57	73 ± 8	719 ± 80
24	3	36	66 ± 7	644 ± 70	92 ± 10	905 ± 98
27	3	41	96 ± 10	945 ± 100	135 ± 15	1329 ± 140
30	3,5	46	131 ± 14	1287 ± 140	184 ± 20	1810 ± 190
33	3,5	50	177 ± 20	1740 ± 200	250 ± 27	2455 ± 270
36	4	55	230 ± 25	2250 ± 250	320 ± 35	3150 ± 350
39	4	60	295 ± 33	2900 ± 330	410 ± 45	4050 ± 450

IMPORTANT

- **This tightening torque table is not valid for screws or nuts that must fasten parts made of nylon or similar materials onto washers or components made of nylon or nonferrous metals or requiring specific tightening torques.**

4.5.2 STANDARD TIGHTENING TORQUES FOR HOSES WITH ORFS

If not specified otherwise, tighten the nuts of the hoses applying the torque specified in the table.
If it is necessary to replace a hose, always use Komatsu original spare parts having the same size of the part to be replaced.



★ Nm (Newton metre): 1 Nm = 0.102 kgm

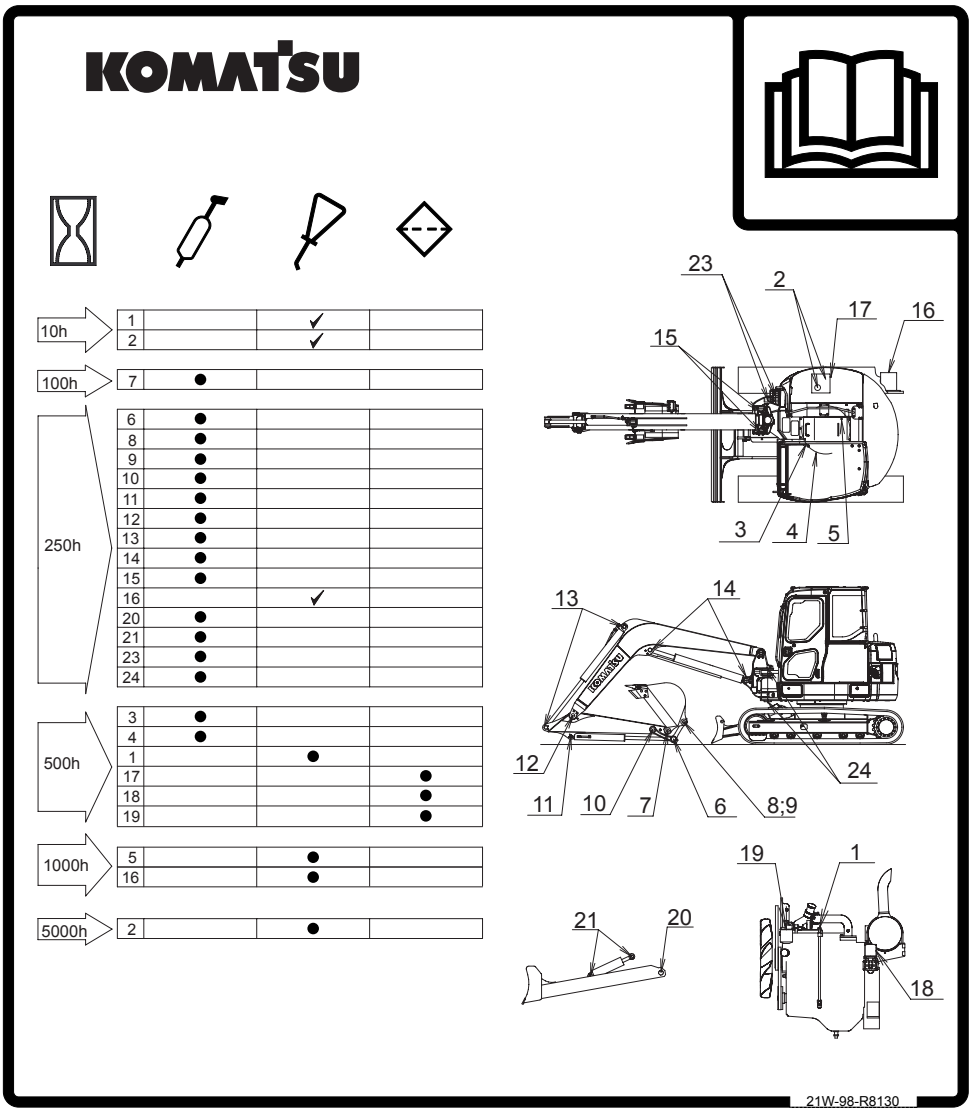
Thread diameter (a)	Wrench size (mm)	TIGHTENING TORQUE	
		kgm	Nm
9/16” - 18	17	3,1 - 3,5	30 - 34
11/16” - 16	22	5,6 - 6,6	55 - 65
13/16” - 16	24	7,6 - 8,7	75 - 85
1” - 14	30	11,7 - 12,7	115 - 125
1.3/16” - 12	36	15,8 - 16,8	155 - 165
1.7/16” - 12	41	18,4 - 20,4	180 - 200
1.11/16” - 12	50	20,4 - 22,4	200 - 220
2” - 12	57	22,4 - 25,5	220 - 250

4.6 LUBRICATION

4.6.1 LUBRICATION DIAGRAM

IMPORTANT

- **For details on how to lubricate specific parts, see "4.9.5.a LUBRICATION" and "4.9.7.a LUBRICATION".**
- **The type of lubricant to be used is indicated in the lubricant table (see "4.4 FUEL, COOLANT AND LUBRICANTS").**



RKA18800

Grease

Oil

Filter

4.7 PERIODICAL CHANGE OF SAFETY-RELATED COMPONENTS

To ensure safety at any moment while driving and using the machine, the operator must carry out all the routine maintenance operations prescribed. Furthermore, the operator must periodically change the components indicated in the table in the following page, which are especially related to safety and fire-prevention rules. These components are subject to wear and since it is particularly difficult to evaluate their conditions through simple routine maintenance, after a certain time interval it is advisable to change them independently of their state, in order to keep them efficient over time. Repair or replace these components immediately in case of failures or anomalies, even if the time interval prescribed for their change has not elapsed yet.

If the pipe clamps show signs of deterioration, like deformations or cracks, provide for changing them together with the pipes.

In addition to the periodical change of the components listed in the following page, the inspections described below are to be carried out on the hydraulic pipes. If any anomaly is observed,

For the quantities and codes of the safety-related components to be changed, see the spare parts catalogue. When changing pipes, always change O rings, gaskets and analogous components.

Type of check	**Items to be checked**
Before starting the engine	Leakages from joints, hydraulic pipes or fuel pipes.
Periodically (monthly)	Leakages from joints, hydraulic pipes or fuel pipes. Damaged hydraulic or fuel pipes (cracks, wear and tear).
Periodically (yearly)	Leakages from joints, hydraulic pipes or fuel pipes. Deteriorated, twisted, damaged hydraulic or fuel pipes (cracks, wear and tear) or pipes in contact with other parts of the machine.

4.7.1 SAFETY-RELATED PARTS

N.	Safety-related components that periodically need changing	Quantity	Change interval
1	Fuel pipe (fuel tank - water separator)	1	Every 2 years or 4000 hours, whichever occurs first.
2	Fuel pipe (water separator – fuel pump prefilter)	1	
3	Fuel pipe (fuel pump prefilter – fuel filter)	1	
4	Fuel pipe (fuel filter – injection pump)	1	
5	Fuel pipe (fuel tank – stop valve)	1	
6	Fuel pipe (fuel tank – air bleed pipe)	1	
7	Fuel recovery pipe (injection pump – filler neck pipe)	2	
8	Return pipe (injector – filler neck pipe)	1	
9	Fuel pipe (fuel tank – filler neck)	2	
10	Fuel pipe (filler neck – filler neck pipe)	1	
11	Hydraulic pipe (main pump delivery)	3	
12	Hydraulic pipe (main pump suction)	3	
13	Hydraulic pipe (boom cylinder - distributor)	4	
14	Hydraulic pipe (arm cylinder - distributor)	4	
15	Hydraulic pipe (bucket cylinder - distributor)	4	
16	Hydraulic pipe (swing motor - distributor)	2	
17	Hydraulic pipe (blade cylinder - distributor)	4	
18	Seat belt	1	Every 3 years

4.8 MAINTENANCE PLAN

If the machine is equipped with hydraulic breaker, the maintenance schedule for some components will be different. For further details, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER" to verify the correct maintenance plan.

4.8.1 MAINTENANCE PLAN

WHEN REQUIRED

a. CHECKING, CLEANING OR CHANGING THE AIR FILTER CARTRIDGE 214
b. CHANGING THE CARTRIDGE IN THE WATER SEPARATOR 218
c. CLEANING THE FUEL TANK 219
d. CHECKING THE TIGHTENING OF THE TRACKS 220
e. CHECKING AND ADJUSTING THE TRACK TENSION 221
f. CHECKING THE ROAD LINERS OR THE RUBBER TRACKS 223
g. CHECKING AND ADJUSTING THE RUBBER TRACK TENSION 225
h. CHANGING THE ROAD LINERS 226
i. CHANGING THE RUBBER TRACKS 227
j. REPLACING THE ROAD LINERS OR STEEL TRACKS WITH RUBBER TRACKS 230
k. ADJUSTING THE BUCKET CLEARANCE 231
l. CHECKING THE WINDSHIELD FLUID LEVEL AND TOPPING UP 232
m. CHECKING, CLEANING AND LUBRICATING THE GUIDE OF THE CAB SLIDING DOOR 233
n. WASHING THE FLOOR 234
o. BLEEDING THE HYDRAULIC SYSTEM 236

CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

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b. CHECKING THE ENGINE OIL LEVEL AND TOPPING UP 121
c. CHECKING THE FUEL LEVEL AND REFUELLING 122
d. CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP 123
e. CHECKING THE AIR FILTER CLOGGING INDICATOR 125
r. CHECKING THE WATER SEPARATOR 125
g. CHECK THE WIRING SYSTEMS 126
h. CHECKING THE HORN 126

MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

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MAINTENANCE EVERY 50 HOURS OF OPERATION

a. DRAINING THE FUEL TANK 240

MAINTENANCE EVERY 100 HOURS OF OPERATION

a. LUBRICATION 241

MAINTENANCE AFTER THE FIRST 250 HOURS OF OPERATION (Operations to be carried out together with those prescribed in paragraph "4.9.7 MAINTENANCE EVERY 250 HOURS OF OPERATION")

a. CHANGING THE FUEL FILTER CARTRIDGE 248
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MAINTENANCE EVERY 250 HOURS OF OPERATION

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MAINTENANCE AFTER THE FIRST 500 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)(Operations to be carried out together with those prescribed in paragraph "4.9.9 MAINTENANCE EVERY 500 HOURS OF OPERATION")

a. CHANGING THE HYDRAULIC OIL AND CLEANING THE INTAKE FILTER (Only for machines in which synthetic biodegradable oil HEES is used) 263

MAINTENANCE EVERY 500 HOURS OF OPERATION

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b. CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER CARTRIDGE 250
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b. CHECKING THE OPERATING CONDITIONS OF THE A/C COMPRESSOR (only for machines with air conditioner)..... 268
c. CHECKING THE WATER PUMP..... 268

MAINTENANCE EVERY 5000 HOURS OF OPERATION

a. CHANGING THE HYDRAULIC OIL AND CLEANING THE INTAKE FILTER..... 269

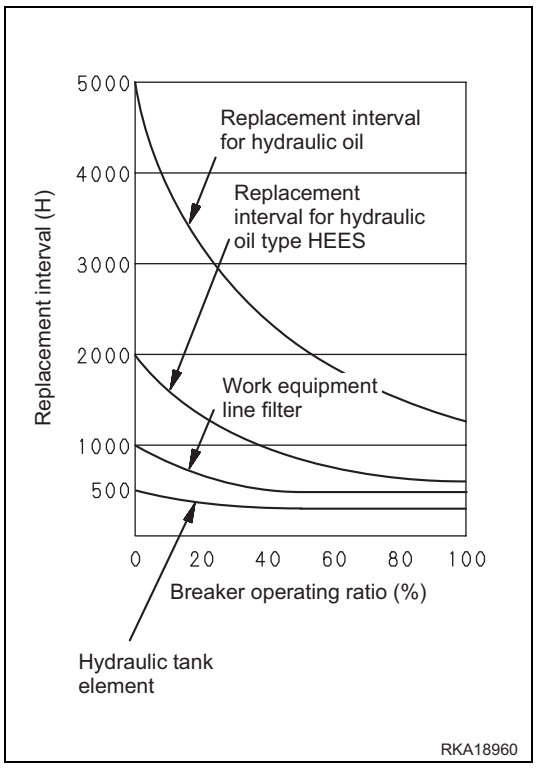
4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER

The hydraulic oil used in the machines provided with demolition hammer deteriorates more quickly than the oil used in normal digging machines, therefore it is advisable to respect the following maintenance plan.

- **Changing the hydraulic oil filter cartridge**
  On new machines, change the hydraulic oil filter cartridge after the first 100-150 hours of operation and for the successive changes keep to the indications given in the table on the right.
  If the machine contains synthetic biodegradable oil type HEES, the filter must be changed after the first 50 hours of operation.

- **Changing the oil in the hydraulic tank**
  Change the oil in the tank according to the intervals indicated in the table on the right.
  On machines containing synthetic biodegradable oil type HEES, change the oil after the first 500 hours of operation and for the successive changes keep to the indications given in the table on the right.

- **Changing the hydraulic oil filter cartridge in the work equipment line (if installed)**
  As a general rule, change the cartridge after 500 hours of operation of the hammer (operating percentage for the hammer: 50% or more) and successively change the cartridge according to the instructions given in the table on the right.



4.9 MAINTENANCE PROCEDURES

4.9.1 WHEN REQUIRED

4.9.1.a CHECKING, CLEANING OR CHANGING THE AIR FILTER CARTRIDGE

⚠ WARNING

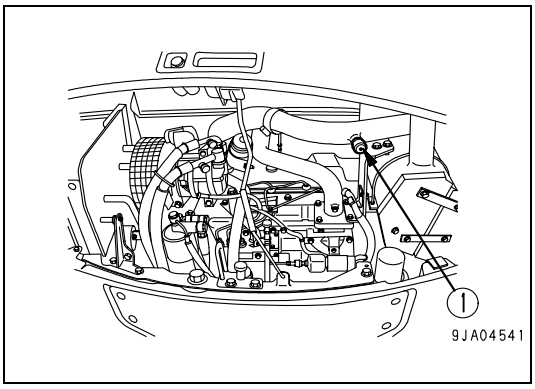
- **Remove the air filter only after stopping the engine and do not start the engine if the air filter is open.**
- **When compressed air is used to clean the filter, dust may get into the eyes. Wear safety goggles and a dust mask during the cleaning operations.**

IMPORTANT

- **The air filtering system consists of a primary filtering element with considerable capacity and of a secondary cartridge that ensures additional safety protection.**
  The primary element can be cleaned with compressed air, while the safety cartridge can only be changed.
- **Clean the filtering element if the red piston in the filter clogging indicator (1) is visible.**

CHECK

1. Open the engine hood. For further details, see paragraph"3.2.9 ENGINE HOOD".
2. If the red piston in the filter clogging indicator (1) is visible, clean the filtering element.

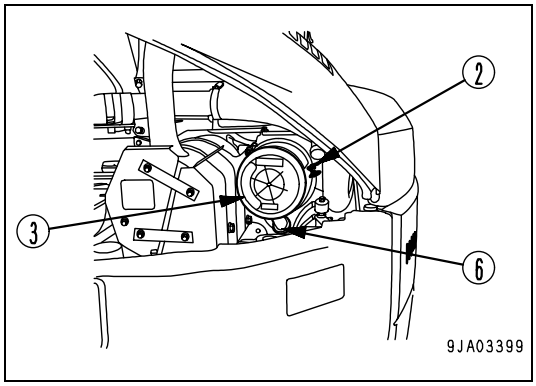


IMPORTANT

- **Do not clean the cartridge if the red piston of the filter clogging indicator (1) is not visible.**
- **In any case, check the cartridge for clogging every 50 hours of operation.**

CLEANING OR CHANGING THE PRIMARY FILTERING ELEMENT

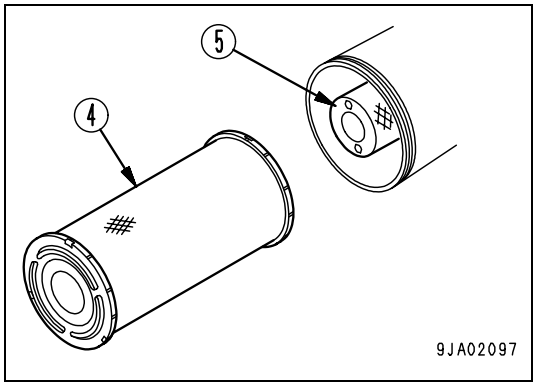
1. Open the engine hood. For further details, see paragraph"3.2.9 ENGINE HOOD".
2. Release the retainers (2) and remove the cover (3).



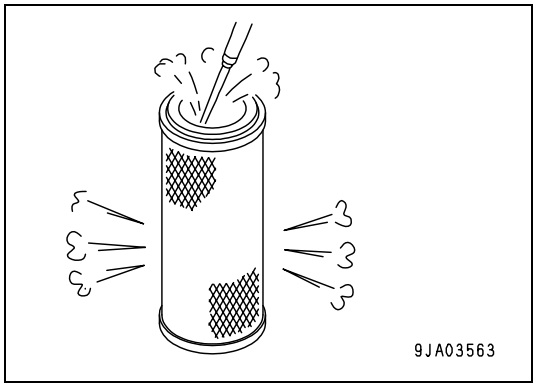
3. Extract the filtering element (4).
4. Clean the inside of the filter body, the cap (3) and the drain valve (6).

IMPORTANT

- **Do not remove the safety cartridge (5). If the safety cartridge is removed, dust may penetrate inside the intake channel and cause serious damage to the engine.**



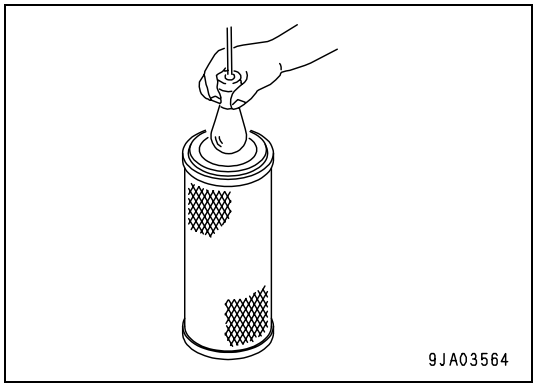
5. Slightly strike the filtering element (4) on the palm of your hand, in such a way as to remove the dust, and blow compressed air on the inner surface, keeping the air jet at a distance of approximately 15 cm and the pressure below 4-5 bars.



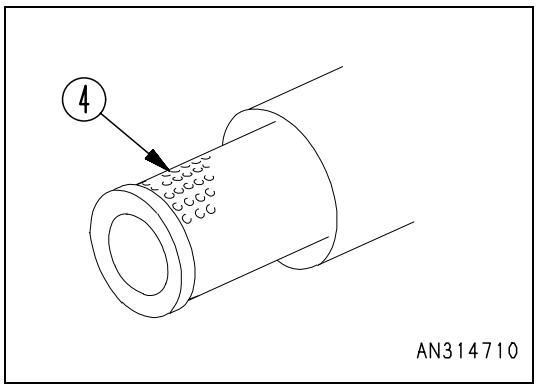
6. After the cleaning operations, inspect the filtering surface for damage by introducing a lamp into it and carefully check the front gaskets. If the cartridge is damaged, change it.

IMPORTANT

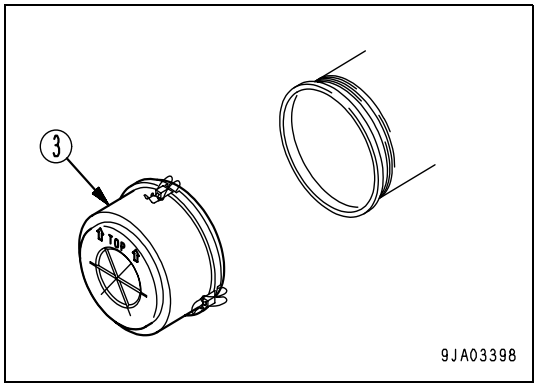
- **When changing the primary filtering element, change also the safety cartridge.**



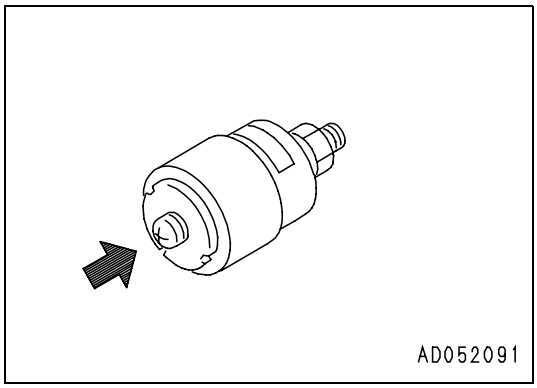
7. Install the cleaned cartridge (4) or a new cartridge.



8. Position the cap (3) with the drain valve (6) facing downwards and secure it with the couplings (2).



9. Press the button on the filter clogging indicator (1) so that the red piston returns to its original position.



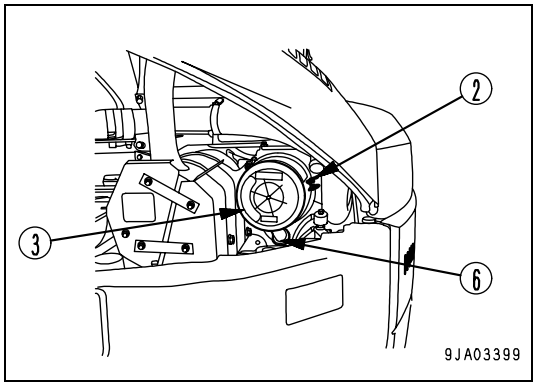
IMPORTANT

- **If shortly after installing the cleaned filtering element, the red piston of the clogging indicator is visible again, it is necessary to change the primary filtering element and the safety cartridge.**
- **Change the primary filtering element after cleaning it for 6 times after one year. The safety cartridge must be changed together with the primary filtering element.**
- **As a reference for the successive change, always mark the date of the cleaning operation on the primary filtering element.**

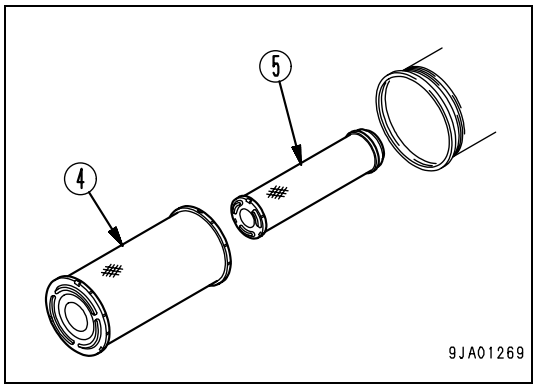
CHANGING THE SAFETY CARTRIDGE

To change the safety cartridge, after removing the primary filtering element, proceed as follows:

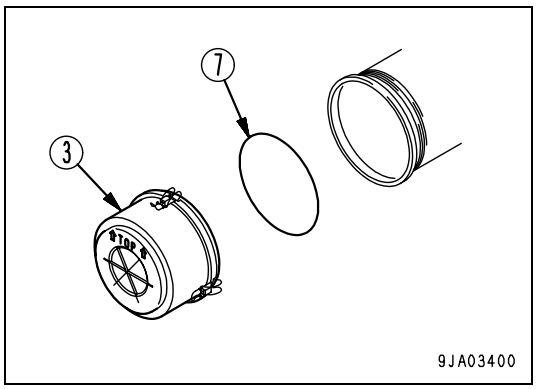
1. Clean the inside of the filter body, the cap (3) and the drain valve (6).
2. Remove the safety cartridge (5) and throw it away.



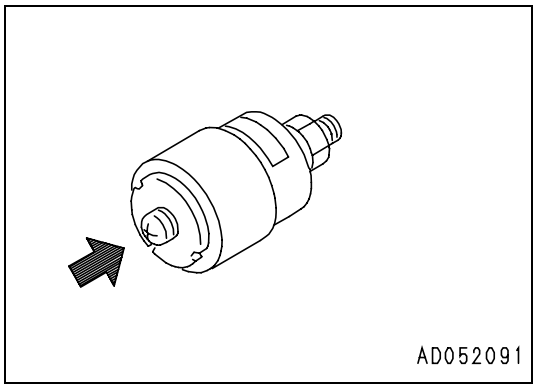
3. Install a new safety cartridge (5) and a new primary element (4), making sure that they are correctly fitted in their seats.



4. Check the conditions of the gasket (7) and, if it is damaged or worn out, change it.
5. Position the cap (3) with the drain valve (6) facing downwards and secure it with the couplings (2).



6. Move the red piston of the filter clogging indicator (1) back to its original position.



4.9.1.b CHANGING THE CARTRIDGE IN THE WATER SEPARATOR

⚠ WARNING

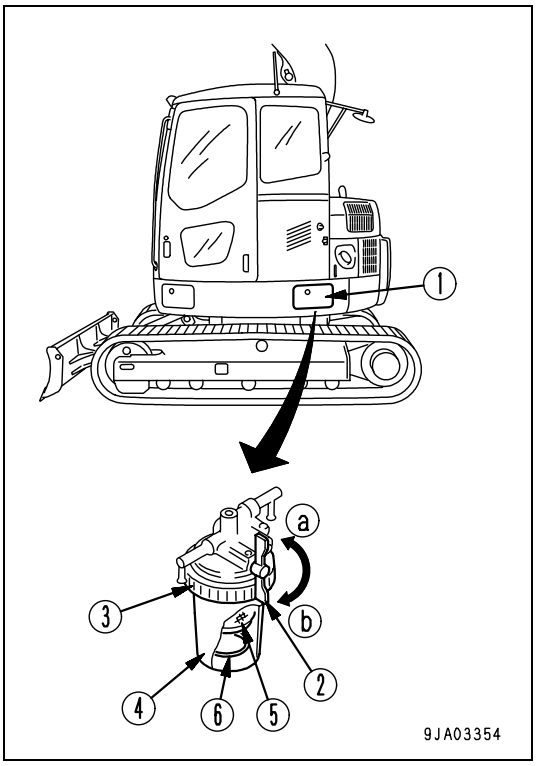
- **Change the cartridge after work, when the engine has cooled down to 40÷45°C.**
- **During these operations some fuel may be spilled; clean the dirty areas immediately, in order to prevent any risk of slipping or fire.**

1. Open the inspection cover (1) on the left side of the machine and turn the lever (2) of the water separator to position CLOSED (a).
2. Loosen the ring (3) with a filter wrench, extract the cup (4), then remove the cartridge (5). Pay attention not to lose the red ring (6) that is inside the cup.
3. Clean the cup (4) with diesel oil or wash oil.
4. After washing, install a new cartridge (5).
5. Insert the red ring (6) in the cup (4) and fill with fuel, install it on the filter housing, then tighten the ring (3).
6. Shift the small lever (2) to the opening position (B).

IMPORTANT

- **When removing the water separator, take care not to lose the red ring contained in the cup.**

7. After changing the cartridge, bleed the circuit.
   For details on the bleeding procedure, see "4.9.9.a " pos. BLEEDING THE CIRCUIT".

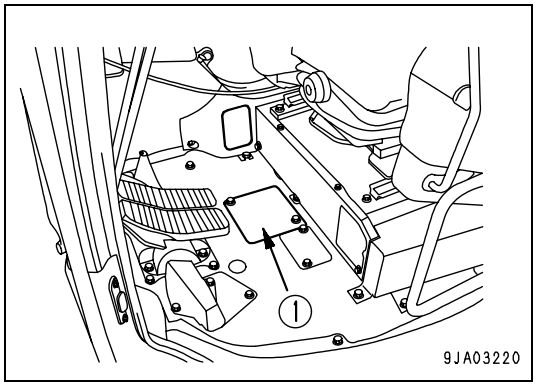


4.9.1.c CLEANING THE FUEL TANK

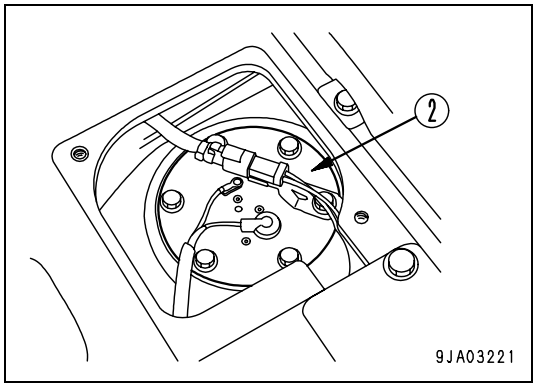
⚠ WARNING

- **When draining the fuel tank, avoid spilling fuel, since this may cause fires.**
- **If some fuel is accidentally spilled, clean the dirty area immediately, in order to prevent it from getting slippery and to avoid fires.**
- **Never use trichloroethylene to wash the inside of the tank. Use exclusively diesel oil.**

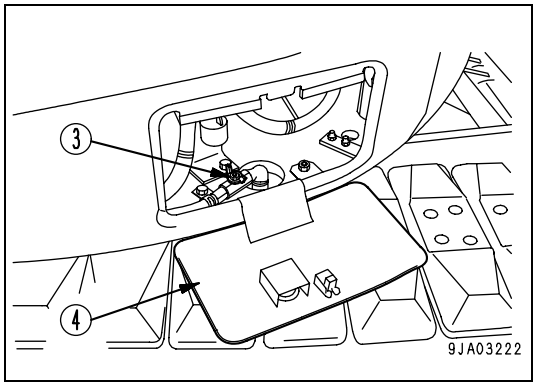
1. Drain the fuel tank, proceeding as indicated in points from 1 to 3 of paragraph "4.9.4.a DRAINING THE FUEL TANK" .
2. Remove the floor mat.
3. Remove the cover (1).



4. Remove the fuel sensor (2).



5. Wash the inside of the tank carefully, using only diesel oil.
6. After the washing cycle, tighten the drain valve (3) and install the fuel sensor(2), the cover (1) and the mat.
7. Close the inspection cover (4).



4.9.1.d CHECKING THE TIGHTENING OF THE TRACKS

(For machines equipped with steel tracks, road liners)

⚠ WARNING

- **To compensate for the inevitable settling movements, it is indispensable to check the tightening torque of the screws (1) after the first 30 hours of operation.**
  Carry out another check after the first 100 hours of running-in and, if the screws have become loose again, repeat the check after 200 hours of operation.
- **If the screws (1) become loose and are not tightened at the required torque, the useful life of the tracks will be shorter.**
- **After tightening, make sure that the nut and the track are in contact with the surface of the link.**

The check must be carried out with the machine parked on level ground.

How to tighten the steel tracks

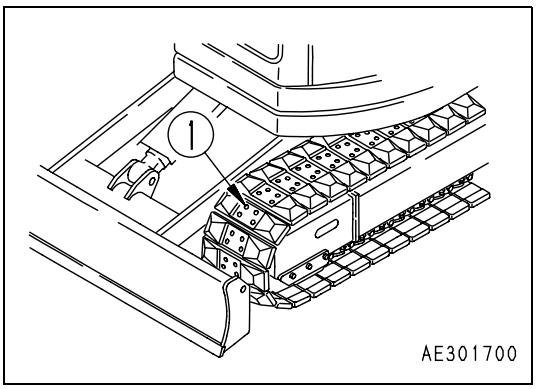
Tighten the screws with an initial torque of 118±19.6 Nm (12±2 kgm), making sure that the nut and the track are in contact with the surface of the link. Then give an additional turn of 90° ± 10°.

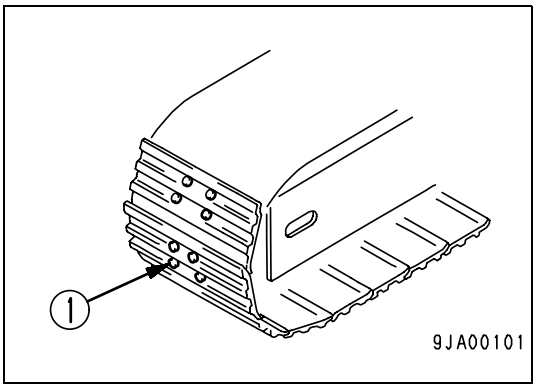
How to tighten the road liners

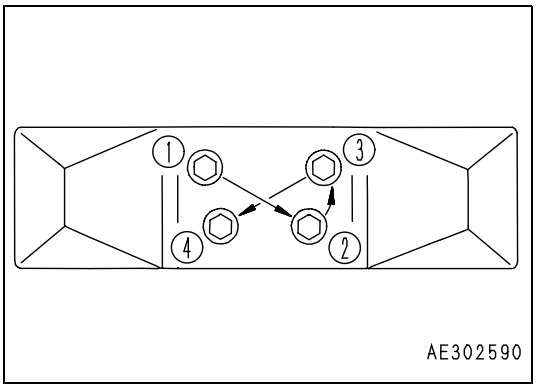
Tighten the screws with a torque of 196±19.6 Nm (20±2 kgm), making sure that the nut and the track are in contact with the surface of the link.

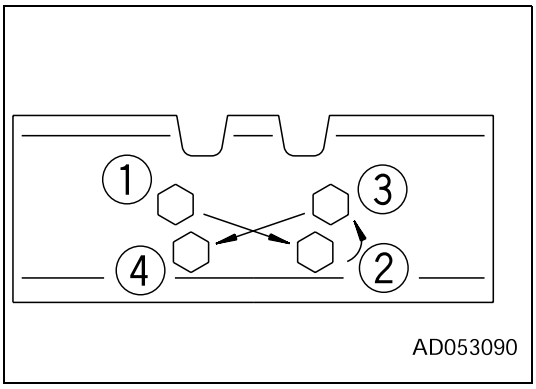
Tightening sequence

The screw tightening sequence for each element must be 1-2-3-4, as shown in the figure.
After tightening, make sure that the nut and the track are in contact with the surface of the link.









4.9.1.e CHECKING AND ADJUSTING THE TRACK TENSION

(For machines equipped with steel tracks, road liners)

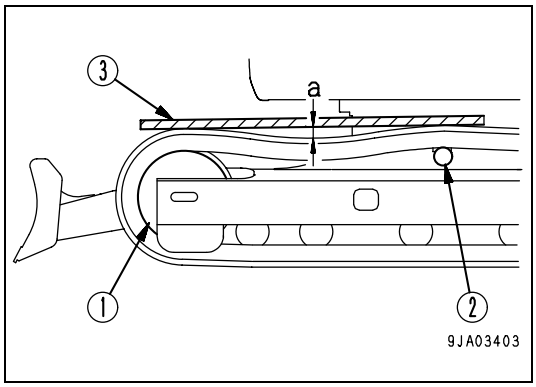
The pins and bushings of the undercarriage wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine works. Therefore it is necessary to check the track tension frequently and to adjust it when necessary.

IMPORTANT

- **To carry out the check and the corresponding maintenance operation, stop the machine on firm and level ground. Check both tracks.**

CHECK

1. With the engine idling, move the machine forward of a distance corresponding to the length of the track on the ground, then lower the equipment to the ground and stop the engine.
2. Choose a perfectly flat bar (3), long enough to cover the distance between the idler roller (1) and the track sliding roller (2), then position it on the track.
3. Measure the maximum deflection between the upper surface of the track and the lower surface of the rod.
   - Standard deflection
     The deflection value "**a**" should be included between 10 and 30 mm.

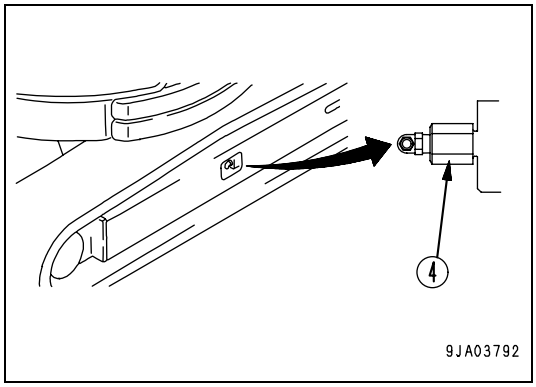


If the track tension does not correspond to the standard value, adjust it by proceeding as indicated below.

ADJUSTMENT

DANGER

- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (1) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (1). If the track tension does not decrease after this operation, contact your Komatsu Dealer.



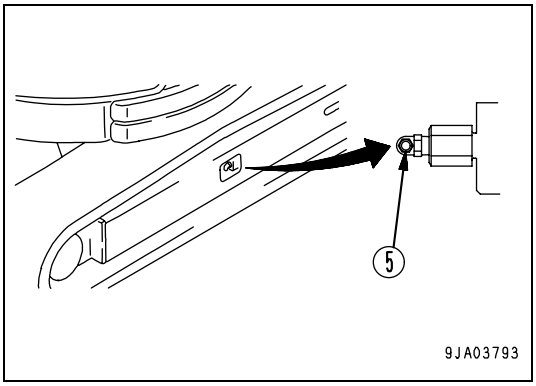
WARNING

- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

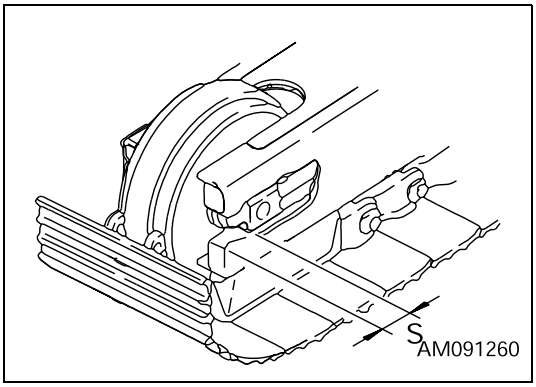
INCREASING THE TRACK TENSION

Prepare a grease pump.

1. Inject grease with the pump through the grease nipple (5).
2. To make sure that the tension is correct, run the engine at idling speed, move the machine slowly forward covering a distance equal to the length of the track on the ground, then stop the machine.
3. Check the track tension again. If it is not correct, adjust it again.



4. Keep injecting grease until the distance S becomes equal to zero (0). If the tension is still insufficient, the pins and bushings are excessively worn, so they must be swapped or replaced. Contact your Komatsu Dealer, who will carry out the necessary operations.

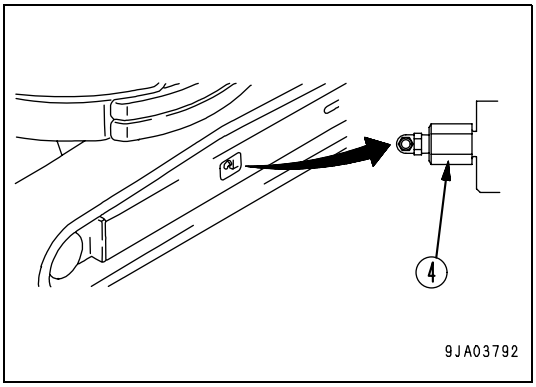


HOW TO DECREASE THE TRACK TENSION

⚠ DANGER

- **It is extremely dangerous to let the grease out following any procedure different from those illustrated below.**
- **If the track tension cannot be reduced with this operation, contact your Komatsu Dealer, who will provide for the necessary repairs.**

1. Gradually loosen the grease valve (4) to let the grease out; do not give the valve more than one turn.
3. If the grease does not come out smoothly, move the machine slowly forward and backward covering a short distance.
3. Tighten the grease valve (4) and remove any trace of grease.
4. To make sure that the tension is correct, run the engine at idling speed, move the machine slowly forward covering a distance equal to the length of the track on the ground, then stop the machine.
5. Check the track tension again. If it is not correct, adjust it again.



IMPORTANT

- **The pins and bushings wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine is working. It is therefore necessary to check the track tension frequently, in order to ensure that it is always correct.**
- **When working on rocky or very irregular surfaces, increase the track tension in order to prevent stones or debris to get stuck between the tracks and the sprocket; on the other hand, reduce the track tension when working on soft or muddy ground, since the soil penetrates between rollers and tracks and tends to increase the tension.**

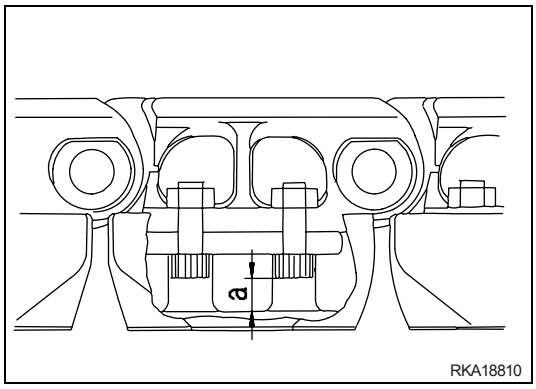
4.9.1.f CHECKING THE ROAD LINERS OR THE RUBBER TRACKS

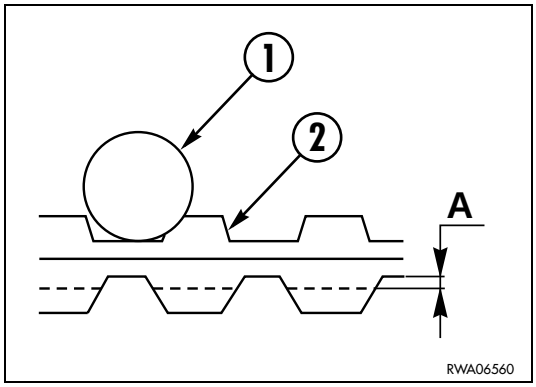
(For machines equipped with road liners or rubber tracks)

If the road liners or the rubber tracks are in the conditions illustrated below, they must be repaired or changed, so contact your Komatsu Dealer for the necessary operations.

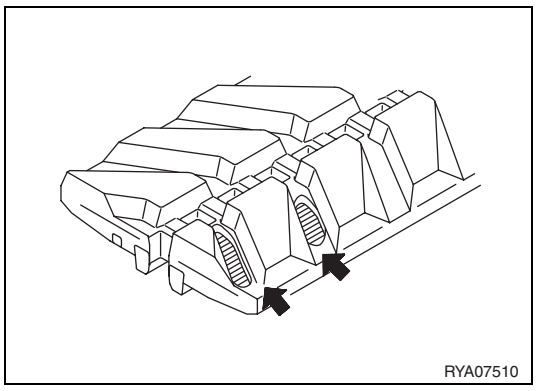
HEIGHT OF THE RUBBER CLAW

- If the height "**a**" of the rubber claw has decreased due to wear, the traction force decreases accordingly. If "a" is less then 5 mm, change the track.
  1- Roller
  2- Rubber track



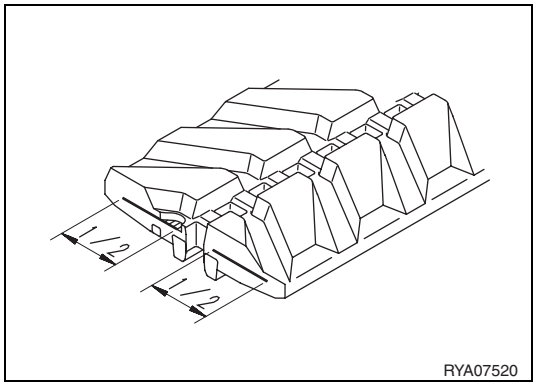


- If the rubber claw wears out and the steel core is visible in two or more points, change the track.
  (For machines equipped with rubber tracks)



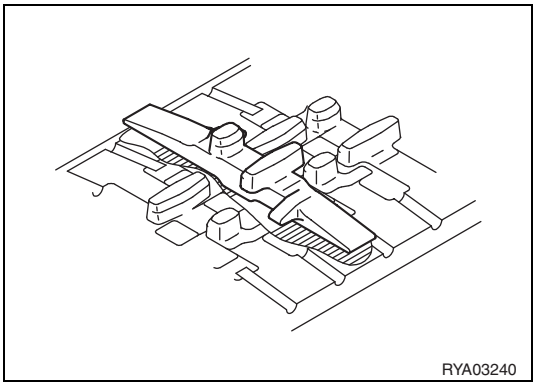
CUTS IN THE STEEL CORE OF THE RUBBER TRACK

When more than one half of the steel core layer is cut on one side, change the track.



SEPARATION OF THE STEEL CORE FROM THE RUBBER TRACK

If the steel core has detached from the track in one or more points, change the track.


RYA03240

RUBBER TRACK TENSION

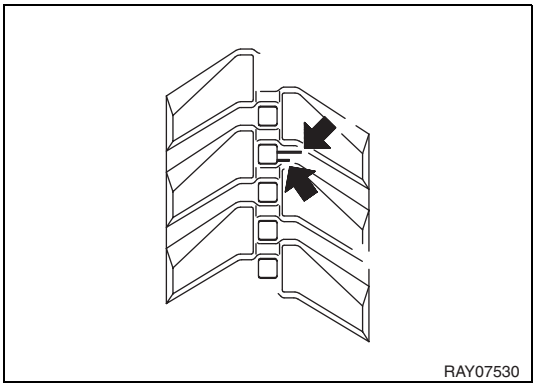
If the tension of the rubber track is still insufficient even after the injection of grease, change it with a new track or change the gasket inside the cylinder.

IMPORTANT

- **If the track tension is such that the track may come off its seat, the track may be lengthened and the track tensioner cylinder damaged.**

BREAKAGE OF THE RUBBER TRACK

If the broken area between the rubber track support claws reaches a length of approximately 60 mm, the track must be repaired. If the broken part is small and short, but the steel core is visible, it is necessary to repair it immediately.


RAY07530

IMPORTANT

- **If the length of the broken area is less then 30 mm or its depth is less than 10 mm, there is no need for repairs.**
- **When it is necessary to decide whether to change, repair or continue to use a road liner or a rubber track, contact your Komatsu Dealer.**

4.9.1.g CHECKING AND ADJUSTING THE RUBBER TRACK TENSION

(For machines equipped with rubber tracks)

The rubber tracks wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine is working. Therefore, it is necessary to check the track wear and tension frequently, in order to keep the tracks correctly tensioned.

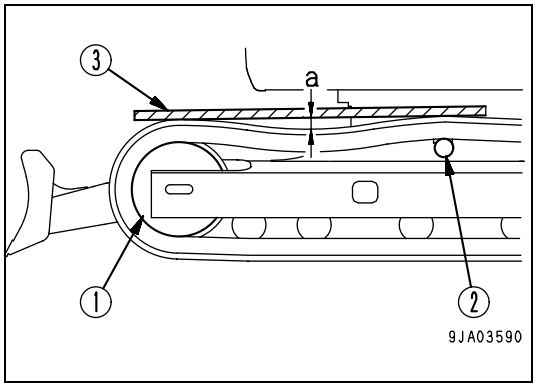
IMPORTANT

- **To carry out the check and the corresponding maintenance operation, stop the machine on firm and level ground. Check both tracks.**
- **In particular, on new machines or after the installation of new tracks, it is advisable to carry out a first check after 10 hours of operation.**
- **Adjusting the track tension frequently until the initial slackening does not occur any longer will prevent the tracks from coming off due to insufficient tension.**
- **If the machine works with loose rubber tracks, they may come off and cause the steel cores to wear out too early.**

CHECK

1. Run the engine at idling speed, move the machine slowly forward covering a distance equal to the length of the track on the ground, then stop the machine.
2. Choose a straight bar (3) long enough to cover the distance between the idler roller (1) and the carrier roller (2), then position it on the track.
3. Measure the maximum deflection between the upper surface of the track and the bar.

- Standard deflection
  The deflection “a“ should be included between 1 and 3 mm.

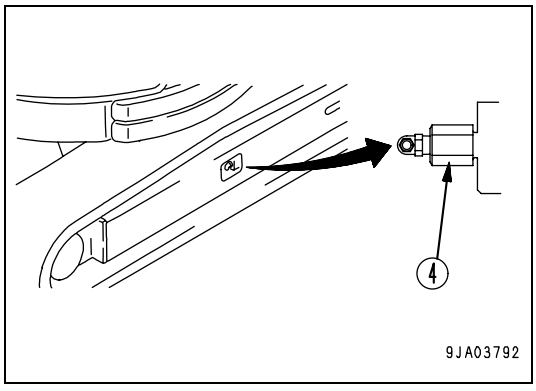


If the track tension does not correspond to the standard value, adjust it by proceeding as indicated below.

ADJUSTMENT

DANGER

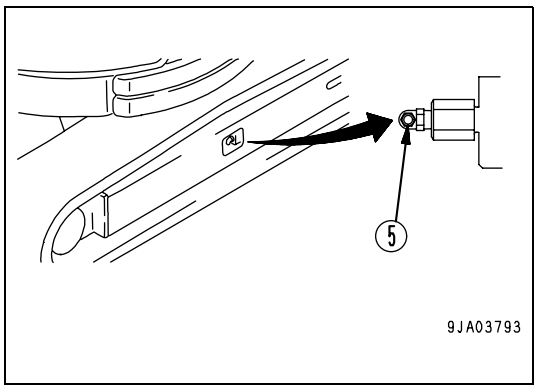
- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (4) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (4). If the track tension does not decrease after this operation, contact your Komatsu Dealer.



WARNING

- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

INCREASING THE TRACK TENSION



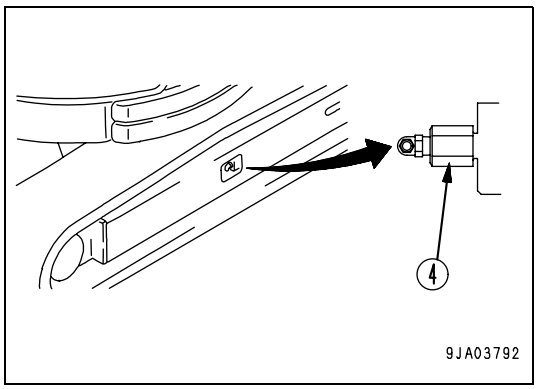
IMPORTANT

- **The standard value is low, therefore take care not to tighten the rubber tracks excessively.**

Prepare a grease pump.

1. Inject grease with the pump through the grease nipple (5).
2. To make sure that the tension is correct, run the engine at idling speed, move the machine slowly forward covering a distance equal to the length of the track on the ground, then stop the machine.
3. Check the rubber track tension again. If it is not correct, adjust it again.
4. If the tension is still insufficient even after the injection of grease, change the rubber tracks or the gasket inside the cylinder. Contact your Komatsu Dealer, who will carry out the necessary operations.

HOW TO DECREASE THE TRACK TENSION



⚠ DANGER

- **It is extremely dangerous to let the grease out following any procedure different from those illustrated below.**
- **If the track tension cannot be reduced with this operation, contact your Komatsu Dealer, who will provide for the necessary repairs.**

1. Gradually loosen the grease valve (4) to let the grease out; do not give the valve more than one turn.
2. If the grease does not come out smoothly, move the machine slowly forward and backward covering a short distance.
3. Tighten the grease valve (4) and remove any trace of grease.
4. To make sure that the tension is correct, run the engine at idling speed, move the machine slowly forward covering a distance equal to the length of the track on the ground, then stop the machine.
5. Check the rubber track tension again. If it is not correct, adjust it again.

IMPORTANT

- **The rubber tracks wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine is working. It is therefore necessary to check the track tension frequently, in order to ensure that it is always correct.**
- **When working on soft or muddy ground, reduce the track tension to extend the service life of the components.**
- **After the installation of new tracks, it is advisable to carry out a first check after 10 hours of operation.**

4.9.1.h CHANGING THE ROAD LINERS

(For machines equipped with road liners)

- If it is necessary to change all the road liners, contact your Komatsu Dealer, who will carry out the necessary operations.
- When, on the other hand, only some road liners must be changed, use the special tool that can be required to Komatsu Dealers.

4.9.1.i CHANGING THE RUBBER TRACKS

(For machines equipped with rubber tracks)

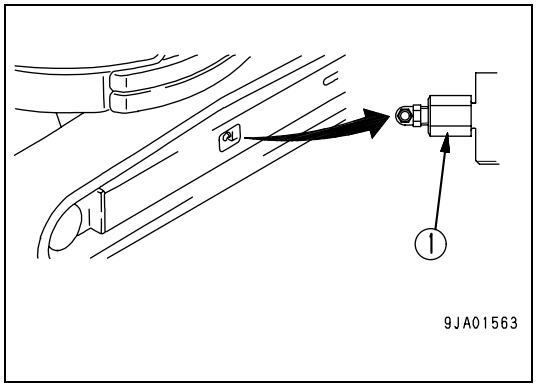
⚠ WARNING

- **This operation must be carried out by two persons. One operator must be seated in the cab and manoeuvre the machine following the signals of the other operator who carries out the change and the adjustment.**
- **The track must be changed with the frame raised from the ground; be careful not to shift any control lever while the operator is working.**
- **During the change do not remove any component apart from the track.**
- **If the track tension cannot be reduced by means of the procedure described above, contact your Komatsu Dealer for the necessary repairs.**

IMPORTANT

- **It is possible to switch from rubber shoes to steel shoes and road liners. However, it is necessary to remove the guard of the idler roller and to carry out an adjustment, then it is advisable to have the change carried out by a Komatsu Dealer.**

REMOVING THE RUBBER TRACKS



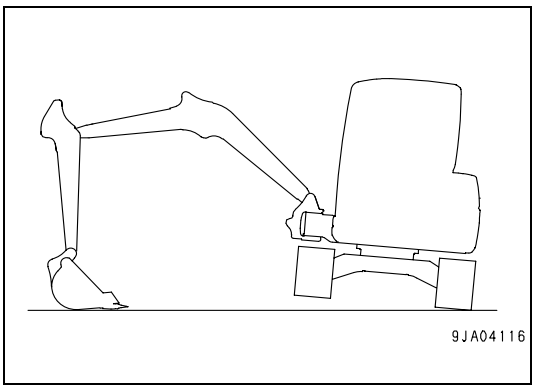
⚠ DANGER

- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (1) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (1). If the track tension does not decrease after this operation, contact your Komatsu Dealer.
- **It is extremely dangerous to let the grease out following any procedure different from the one indicated below.**
- **When installing or removing the tracks, before turning the sprocket make sure that the grease contained in the cylinder has been removed.**

⚠ WARNING

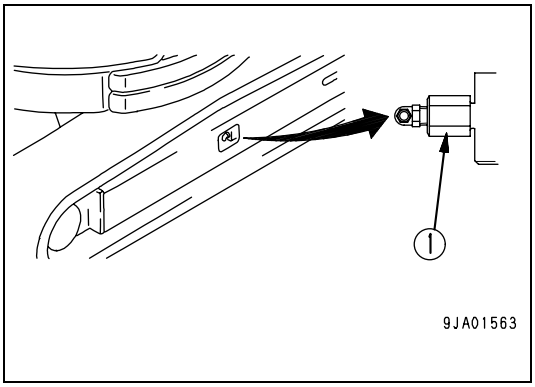
- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

1. Lift the frame by means of the boom and the arm. Operate the levers slowly.

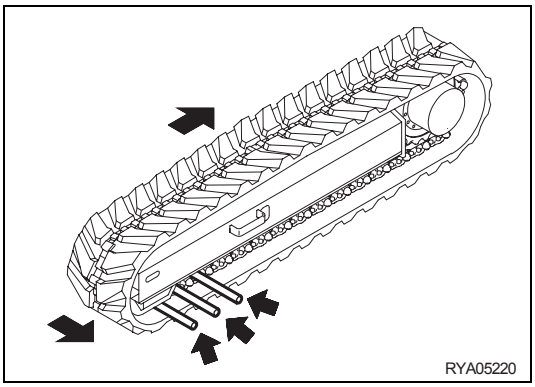


2. Loosen the grease valve (1) gradually to release the grease.

3 - When loosening the grease valve (1), do not give more than one turn.

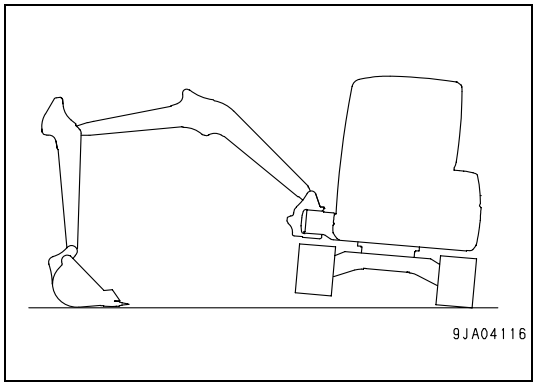


4. Introduce the steel tubes in the rubber track, turn the sprocket as if in reverse, so that the steel tubes lift the track from the idler roller, then make the track slide sidewards and remove it.

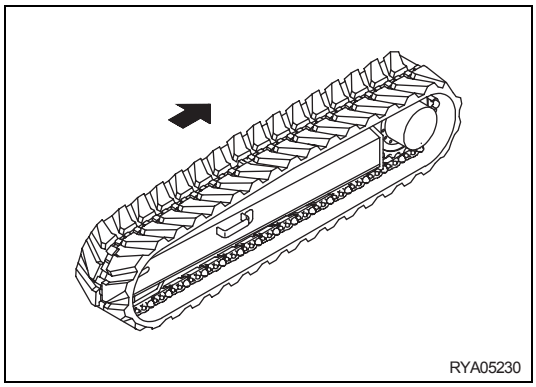


INSTALLING THE RUBBER TRACKS

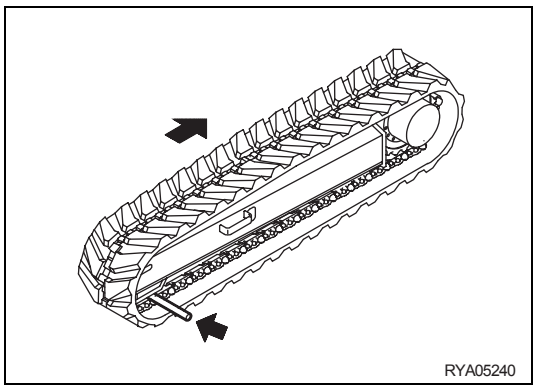
1. Lift the frame by means of the boom and the arm. Operate the levers slowly.



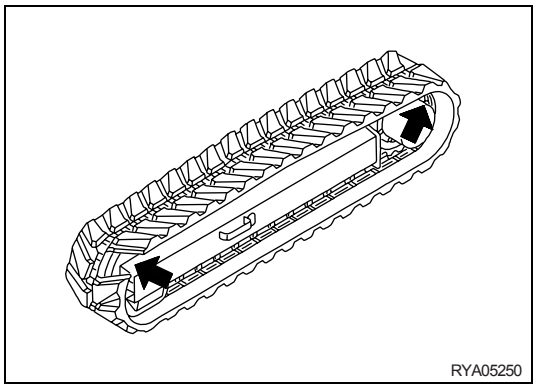
2. Mesh the rubber track with the sprocket and fit it on the idler roller.
3. Turn the sprocket as if in reverse, then push the track inwards and stop turning.



4. Insert a steel tube in the rubber track, then turn the sprocket again and fit the rubber track securely on the idler roller.



5. Stop turning and make sure that the rubber track is correctly positioned on the sprocket and the idler roller.
6. Adjust the tension of the rubber track. For further details, see "4.9.1.g CHECKING AND ADJUSTING THE RUBBER TRACK TENSION".
7. Make sure that the track tension is correct and that the track is correctly positioned on the sprocket and the idler roller, then rest the machine on the ground.



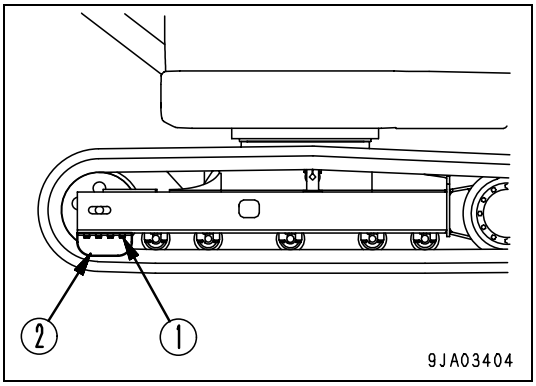
4.9.1.j REPLACING THE ROAD LINERS OR STEEL TRACKS WITH RUBBER TRACKS

⚠ WARNING

- **When switching from steel tracks or road liners to rubber tracks, or vice versa, it is necessary to remove and adjust the shock absorber of the idler roller, and this operation should be carried out by a Komatsu Dealer.**

REPLACING THE ROAD LINERS OR STEEL TRACKS WITH RUBBER TRACKS

1. Remove the bolts (1) and the idler roller guard (2).
2. Remove the steel track or road liner and install the rubber track.



REPLACING THE RUBBER TRACKS WITH STEEL TRACKS OR ROAD LINERS

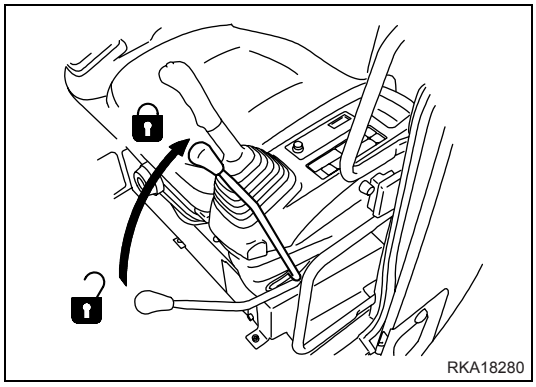
1. Remove the rubber track and install the steel track or the road liner.
2. Install the idler roller guard (2) with the relative bolts (1).

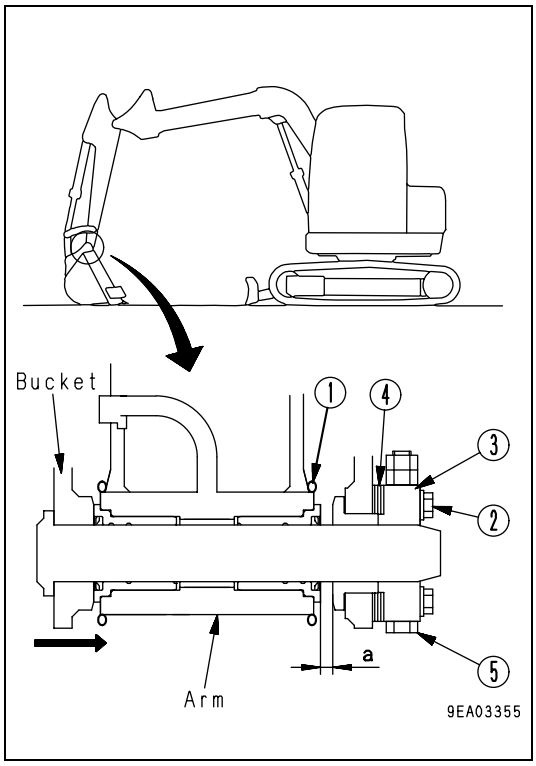
4.9.1.k ADJUSTING THE BUCKET CLEARANCE

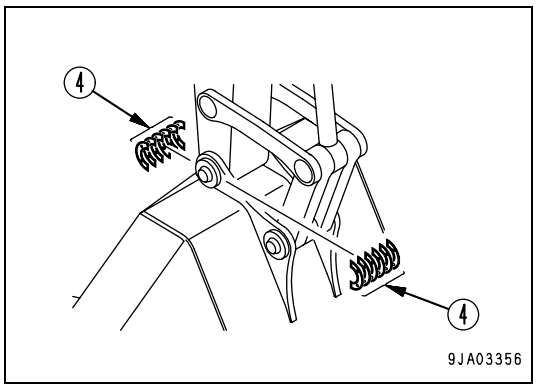
⚠ WARNING

- **Any accidental movement of the work equipment during the adjustment of the bucket clearance is dangerous. Lower the work equipment to the ground in a stable position, then shift the safety lever to position “lock” and stop the engine.**

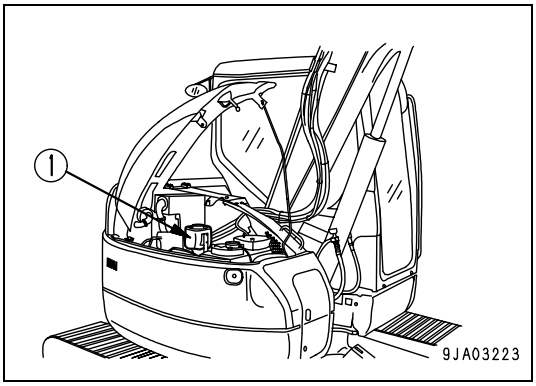
1. Position the work equipment as indicated in the diagram on the right, then stop the engine and shift the safety lever to position “LOCK”.
2. Move the O ring (1) of the articulation and measure the clearance “a”.
   The measurement is easier if the bucket is moved completely to one side (right side in the diagram) or the other, so that the entire clearance can be measured in a single point.
   To obtain a precise measurement, use a gauge.
3. Loosen the 4 plate bolts (2) and loosen the plate (3).
   The shim is of the type in two pieces, therefore the operation can be carried out without removing the bolts.
4. Remove a number of shims (4) corresponding to the dimension of the clearance “a”. One pair of shims makes up a set and each single shim measures 0.5 mm. If the clearance “a” is smaller than one single shim, do not attempt to tighten the bolt (2) to carry out the adjustment.
5. Tighten the four bolts (2).
   If the bolts (2) are too stiff to be tightened, extract the bolt (5) that retains the pin (5) to facilitate the tightening operation.







4.9.1.l CHECKING THE WINDSHIELD FLUID LEVEL AND TOPPING UP



The reservoir (1) is positioned in the side cover and contains detergent for the front windshield; make sure that the reservoir is always full. If necessary, add non-flammable detergent of the type used for cars.
While topping up, be careful to prevent dust from getting into the reservoir.

IMPORTANT

- **To fill the reservoir, use only non-flammable detergent of the type used for cars.**
- **Do not use the antifreezes used in engine cooling systems.**

Quantity of detergent to be mixed with water

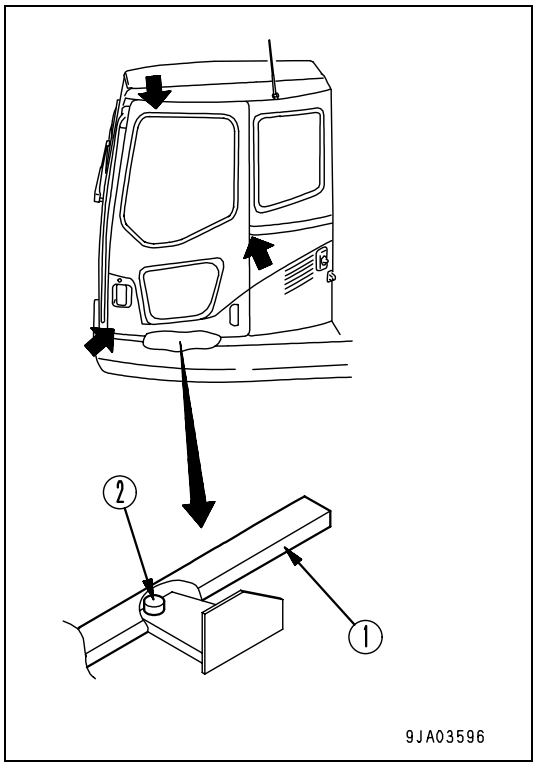
Proportions vary according to the ambient temperature. Before topping up, it is advisable to dilute the detergent with water according to the quantities indicated in the following table.

Area, season	Proportions	Freezing temperature
Normal	Detergent 1/3 Water 2/3	-4 °C
Cold area - winter	Detergent 1/2 Water 1/2	-6 °C
Very cold area - winter	Undiluted detergent	-16 °C

4.9.1.m CHECKING, CLEANING AND LUBRICATING THE GUIDE OF THE CAB SLIDING DOOR

CHECK

When opening or closing the sliding door, this may not slide smoothly due to the presence of dirt in the sliding guide. In this case, thoroughly clean the guide (1) and the roller (2), and lubricate the three points indicated in the figure.



CLEANING

1. Open and close the door more than once and remove the dirt from the guide (1) using a brush.
2. Using a cloth, remove any further residue from the guide (1).

LUBRICATION

IMPORTANT

- **Do not use high-viscosity oil for lubrication. Use only grease.**

1. Spray the lubricant on the guide (1) and on the roller (2) uniformly.
2. After lubrication, slide the door and make sure that it can be easily opened and closed. If it is still difficult to move the door, contact your Komatsu Dealer for the necessary repairs.

4.9.1.n WASHING THE FLOOR

The floor can be washed with water.

⚠ WARNING

- **When the machine is inclined, use blocks to stabilize it and carry out the necessary operations very carefully.**
- **If the control levers are inadvertently touched, the work equipment or the machine may move suddenly and cause serious accidents. Before leaving the operator seat, shift the safety lever to the "locked" position.**

IMPORTANT

- **When washing the cab floor, avoid wetting the connector and the filters of the air conditioner.**

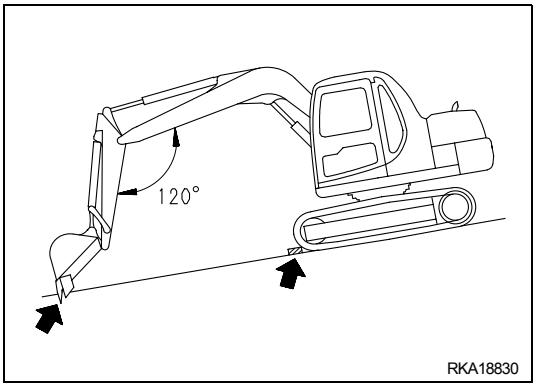
HOW TO INCLINE THE MACHINE

A – How to proceed on a slope

⚠ CAUTION

- **The ground should be even and compact.**

1. Stop the machine so that the work equipment is positioned facing downward.
2. Put some blocks under the track and thrust the work equipment into the ground.

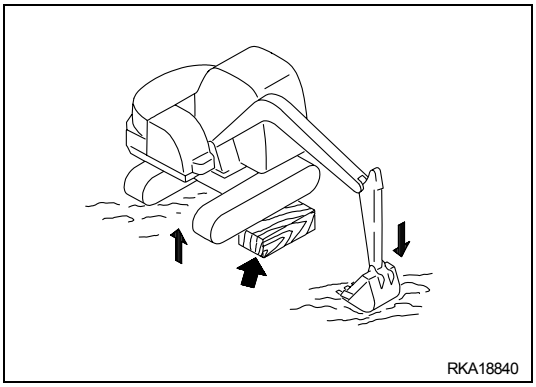


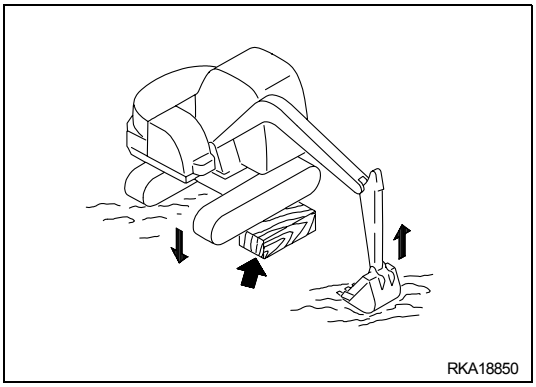
B – How to proceed using a block

⚠ CAUTION

- **Find an area where the ground is even and compact.**
- **Position some blocks under the frame to stabilize the machine; carry out this operation with the maximum care.**

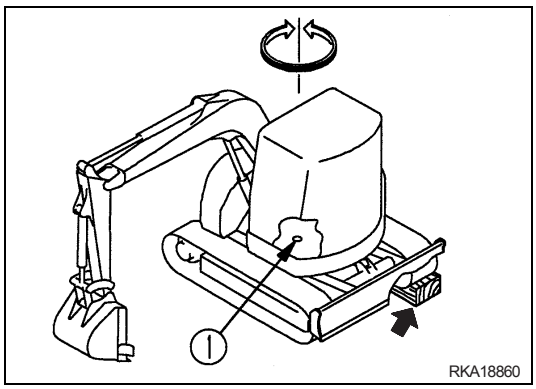
1. Lift the machine using the bucket and the arm.
   Operate the levers slowly.
2. Insert a block firmly between the ground and the lifted track and make sure that the machine is stable.
3. Lift the bucket slowly and lower the machine.
   Make sure that the machine is always stable during this operation.



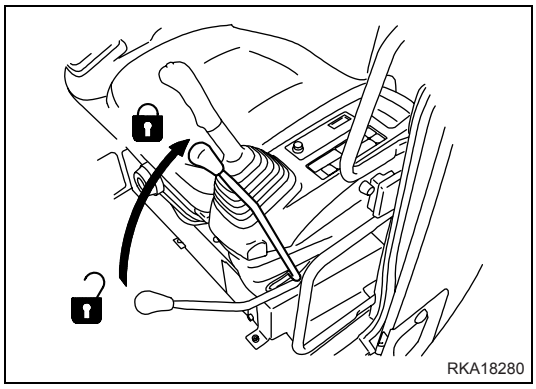


WASHING THE FLOOR

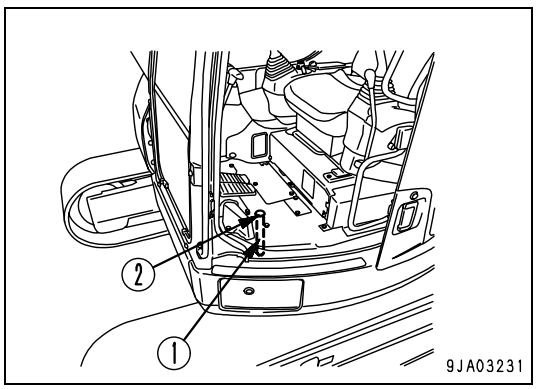
1. Incline the machine.
   For further details, see "How to incline the machine".
2. Swing the turret slowly, so that the water draining hole (1) on the cab floor is positioned on the lower side.
3. Rest the work equipment on the ground and position the machine so that it is stable.



4. Shift the safety lever to position “lock” and stop the machine.



5. Remove the floor mat.
6. Remove the plug (2).
7. Wash the floor with water draining the dirt through the hole (1).
8. After completing the washing operation, put back the plug (2) and the mat.



4.9.1.o BLEEDING THE HYDRAULIC SYSTEM

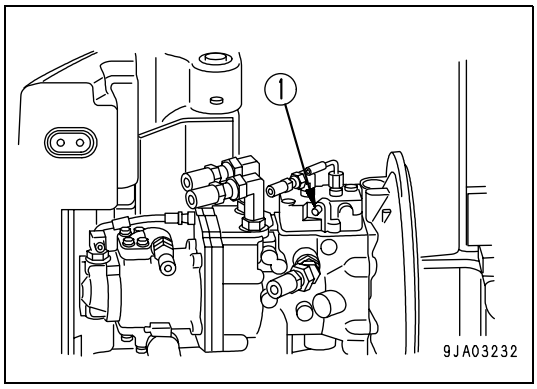
For further details, see "3.3.6 STARTING THE ENGINE". If it is necessary to refer to the engine starting operations, to the machine steering or stopping procedure, see section DESCRIPTION AND USE OF THE MACHINE.

Bleeding the pump

IMPORTANT

- **If the pump is operated without filling it with hydraulic oil, it may be damaged. Make sure that the bleeding operation has been completed.**

1. Loosen the air bleed plug (1) installed on the drain opening and make sure that oil flows out (this means that the air bleeding operation has been completed).
2. After completing the bleeding operation, tighten the plug.



Bleeding the air between the pump and the hydraulic tank

IMPORTANT

- **If the engine runs at high speed and the air between the pump and the hydraulic tank has not been bled, an anomalous generation of heat will take place and this may damage the pump.**

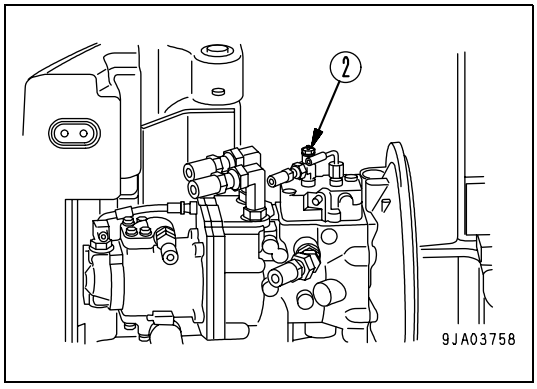
1. Start the engine and make it run at an average speed. For further details, see "3.3.6 STARTING THE ENGINE".
2. Operate the work equipment slowly for approximately 5 minutes, in such a way as to bleed the circuit.

Bleeding the Load Sensing circuit.
(This operation must be carried out only when changing the hydraulic pump, the valve or a pipe in the Load Sensing circuit).

IMPORTANT

- **Failure to bleed the Load Sensing circuit may cause malfunctions in the work equipment.**

1. Loosen the bleed valve (2) installed on the LS (Load Sensing) port of the hydraulic pump.
2. Let the engine idle for 2 minutes.
3. Keep operating the bucket for about 2 minutes (extending and retracting it every time to the end of stroke).
4. After completing the operation, tighten the bleed valve (2).



Bleeding the cylinders

IMPORTANT

- **If the engine runs at high speed soon after starting or a cylinder is brought to the end of stroke, the air that enters the cylinder may damage the sealing gaskets.**

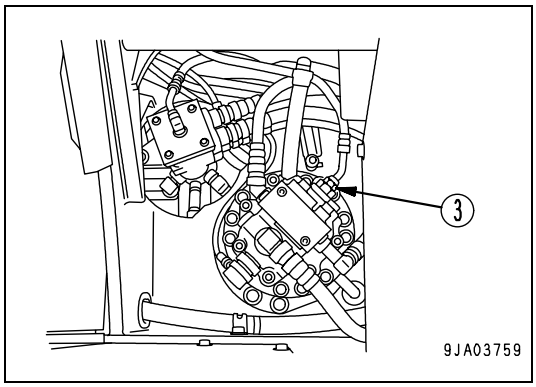
1. Let the engine run at an average speed and extend and retract the cylinders 4-5 times up to a point 100 mm away from the end of stroke. (Take care to avoid reaching the end of stroke).
2. Successively, operate each cylinder 3-4 times, reaching the end of stroke.
3. Finally, operate each cylinder 4-5 times reaching the end of stroke to eliminate the air completely.

Bleeding the swing motor
(only after draining the oil from the swing motor casing)

IMPORTANT

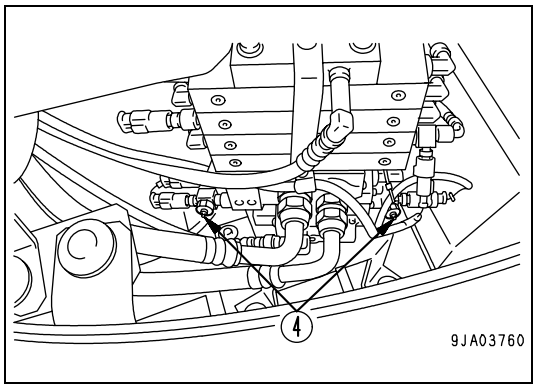
- **If the swing motor is not bled, the motor bearings may be damaged.**

1. Loosen the pipe (3), at the same time letting the engine idle. Tighten the pipe again when the oil starts to flow out. Do not attempt to carry out a rotation during this operation.
2. Let the engine idle and slowly carry out a rotation movement to the right and to the left, more than twice per side.



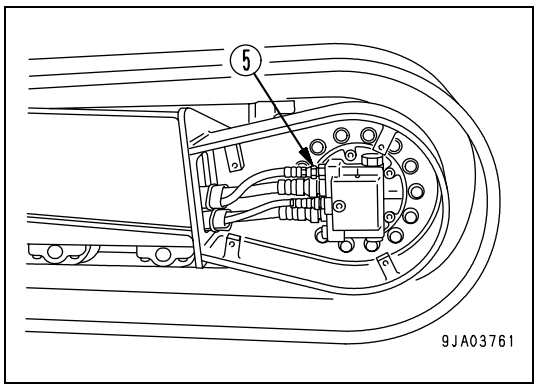
Bleeding the PPC swing circuit

1. Bleed the circuit through the bleed valve (4) installed on the main valve inside the cover on the right side of the machine.

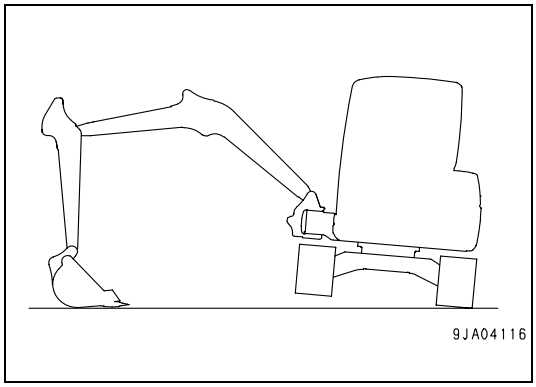


Bleeding the travel motor
(only after draining the oil from the travel motor casing).

1. Let the engine idle, remove the pipe (5) from the opening D, then, when the oil has flown out, tighten it again.



2. Let the engine idle and turn the work equipment 90° to move them to the side of the track.
3. Lift the machine using the jacks until the track is slightly raised from the ground. Make the track turn idly for 2 minutes. Repeat this procedure on both the left and right side of the machine.



Bleeding the attachments (when installed)

IMPORTANT
- **If the manufacturer of an attachment indicates a specific bleeding procedure, follow the instructions.**

If a hammer or another attachment is installed on the machine, let the engine idle and operate the attachment control pedal repeatedly (approximately 10 times) until bleeding the circuit completely.

IMPORTANT
- **After the bleeding operation, stop the engine and wait at least 5 minutes before starting work. This will eliminate the air bubbles from the oil present inside the hydraulic cylinders.**
- **Make sure that there are no oil leakages and remove any oil that may have been spilled.**

4.9.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

⚠ WARNING

- **Dirt, oil and fuel in the engine compartment near hot parts may damage the machine and even cause fires.**
  Check frequently and repair any leakage immediately; if they occur repeatedly, contact your Komatsu Dealer.

For details on the following items, see "3.3.2 DAILY CHECKS".

a - CHECKING THE COOLANT LEVEL AND TOPPING UP
b - CHECKING THE ENGINE OIL LEVEL AND TOPPING UP
c - Check the fuel level and top up
d - CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP
e - Check the air filter clogging indicator
f - CHECKING THE WATER SEPARATOR
g - Check the wiring systems
h - CHECKING THE HORN

4.9.3 MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

The following maintenance operation should be carried out after the first 50 hours of use.

a - CHANGE THE HYDRAULIC OIL DRAIN FILTER

For further details, see paragraph “EVERY 1000 HOURS”.

4.9.4 MAINTENANCE EVERY 50 HOURS OF OPERATION

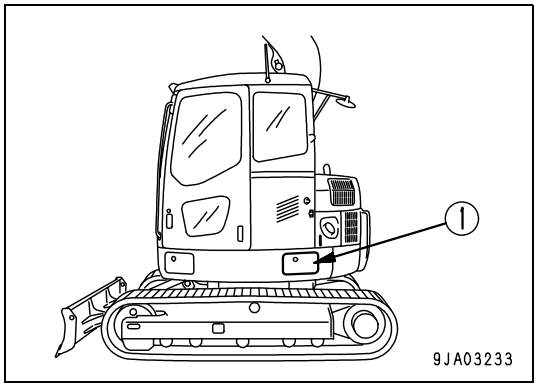
4.9.4.a DRAINING THE FUEL TANK

⚠ WARNING

- **When draining the fuel tank, avoid spilling fuel, since this may cause fires.**
- **If some fuel is accidentally spilled, clean the dirty area immediately, in order to prevent it from getting slippery and to avoid fires.**

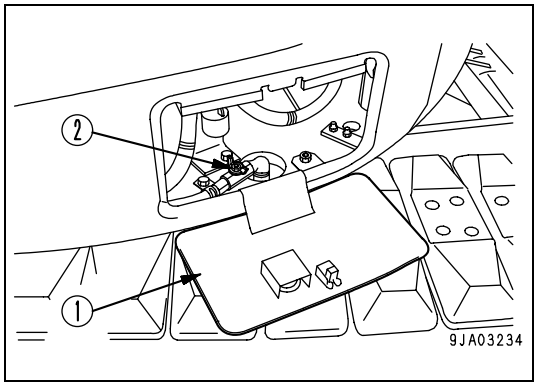
Carry out this procedure before starting the machine.

1. Swing the turret so that the inspection cover (1) is positioned between the tracks.
2. Open the inspection cover (1).
3. Position a container under the drain valve to collect sediments and water.
4. Open the drain valve (2) and drain the fuel together with the sediments and water accumulated on the bottom of the tank. When carrying out this operation, be careful not to spil fuel on yourself.
5. When only clean fuel flows out, close the drain valve (2).
6. Close the inspection cover (1).



IMPORTANT

- **The tank must be drained before starting the engine, with temperatures exceeding 0°C; when the temperature is below 0°C, the tank must be drained at the end of work or in any case with the machine at operating temperature, in order to prevent the condensate from freezing.**
- **The condensate and the impurities that may have accumulated inside the tank must be drained before refuelling.**
- **Never use trichloroethylene to wash the inside of the tank. Use exclusively diesel oil.**



4.9.5 MAINTENANCE EVERY 100 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50 HOURS.

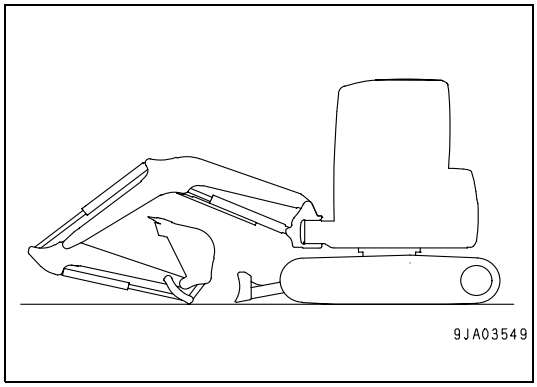
4.9.5.a LUBRICATION

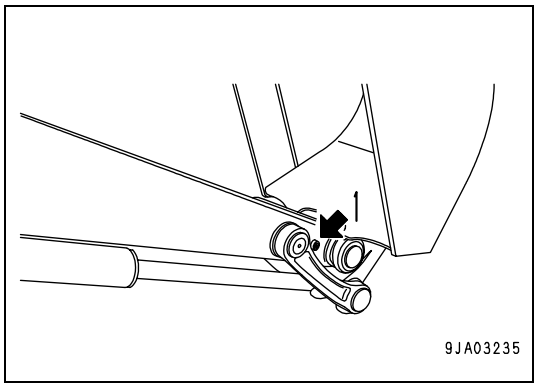
IMPORTANT

- **Clean the grease nipples before applying the greasing pump.**
- **After lubrication, remove all the contaminated grease that may have spread out of the nipples.**
- **If the machine is used in difficult conditions, carry out this operation more frequently than usual.**
- **As a general rule, it is important to consider that each cylinder is provided with two grease nipples positioned on the couplings and that each pin serving as fulcrum point for a movement is provided with at least one grease nipple.**
- **When running in a new machine, lubricate every 10 hours for the first 100 hours of operation.**
- **After carrying out digging operations with the equipment immersed in water, always lubricate the pins that have been in contact with water..**
- Prepare a grease pump.

1. Set the machine in the correct position for the lubrification procedure, as shown in the diagram on the right, lower the work equipment to the ground, then stop the engine.
2. Use the grease pump to inject grease through the lubrication points indicated by the arrows.
3. After completing the lubrication procedure, remove any grease that may have come out of the lubrication points.

(1) Arm-bucket coupling pin (1 point)





4.9.6 MAINTENANCE AFTER THE FIRST 250 HOURS OF OPERATION

The following maintenance operation must be carried out after the first 250 hours of operation, together with the maintenance operations to be carried out “EVERY 250 HOURS”.

- CHANGING THE FUEL FILTER CARTRIDGE
- CHANGING THE ENGINE OIL AND THE FILTER CARTRIDGE

For further details, see paragraph “EVERY 500 HOURS”.

4.9.7 MAINTENANCE EVERY 250 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50 HOURS.

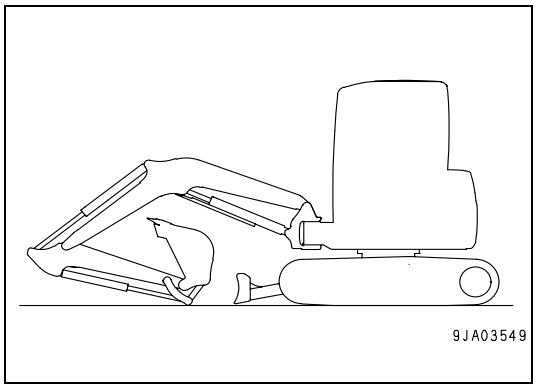
4.9.7.a LUBRICATION

IMPORTANT

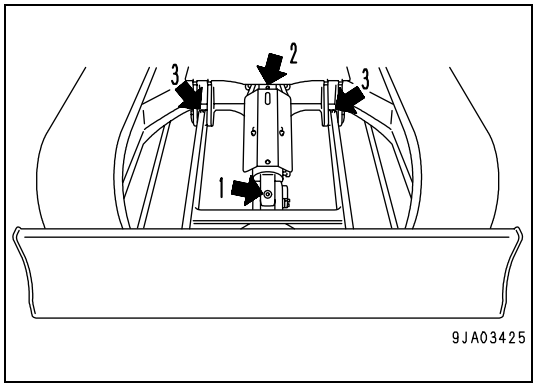
- **Clean the grease nipples before applying the greasing pump.**
- **After lubrication, remove all the contaminated grease that may have spread out of the nipples.**
- **If the machine is used in difficult conditions, carry out this operation more frequently than usual.**
- **As a general rule, it is important to consider that each cylinder is provided with two grease nipples positioned on the couplings and that each pin serving as fulcrum point for a movement is provided with at least one grease nipple.**
- **When running in a new machine, lubricate every 10 hours for the first 100 hours of operation.**
- **After carrying out digging operations with the equipment immersed in water, always lubricate the pins that have been in contact with water..**

- Prepare a grease gun.

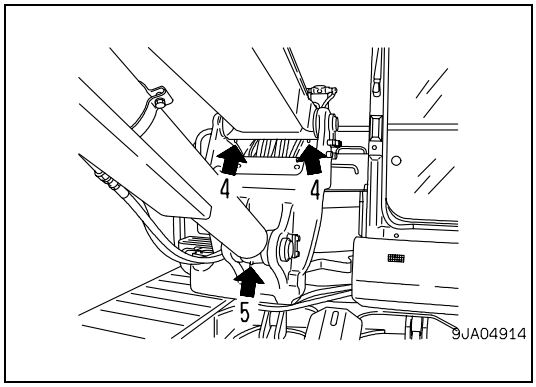
1. Set the machine in the correct position for the lubrification procedure, as shown in the diagram on the right, lower the work equipment to the ground, then stop the engine.
2. Use the grease pump to inject grease through the lubrication points indicated by the arrows.
3. After completing the lubrication procedure, remove any grease that may have come out of the lubrication points.



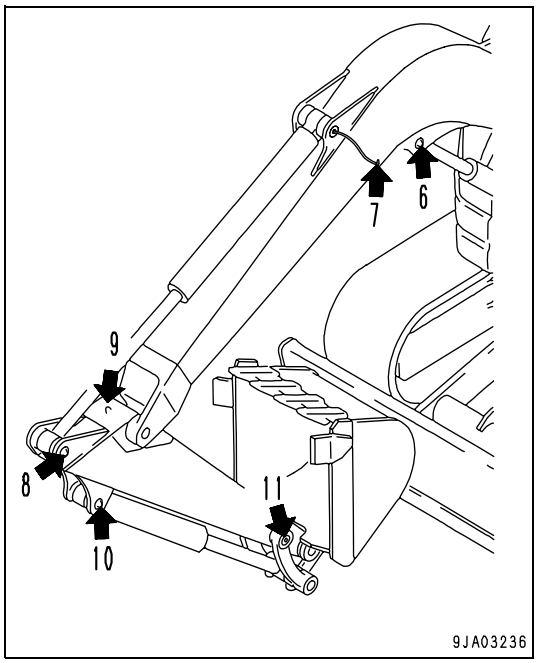
(1) Blade cylinder base pin (1 point)
(2) Blade cylinder rod end pin (1 point)
(3) Blade base pin (2 points)



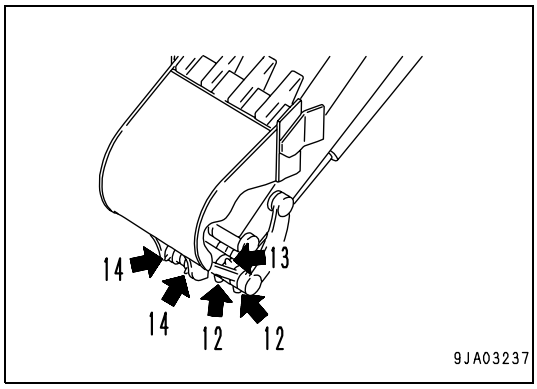
(4) Boom base pin (2 points)
(5) Boom cylinder base pin (1 point)



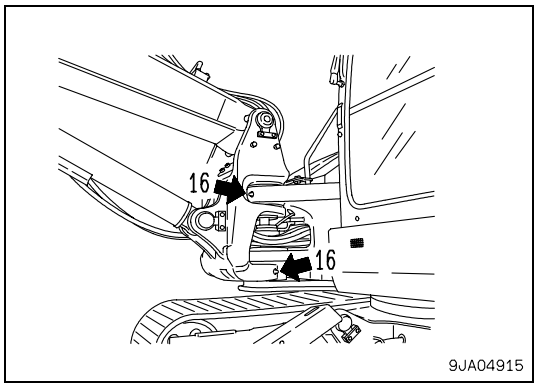
(6) Boom cylinder rod end pin (1 point)
(7) Arm cylinder base pin (2 points)
(8) Arm cylinder rod end pin (1 point)
(9) Boom-arm coupling pin (1 point)
(10) Bucket cylinder base pin (1 point)
(11) Arm articulation pin (1 point)



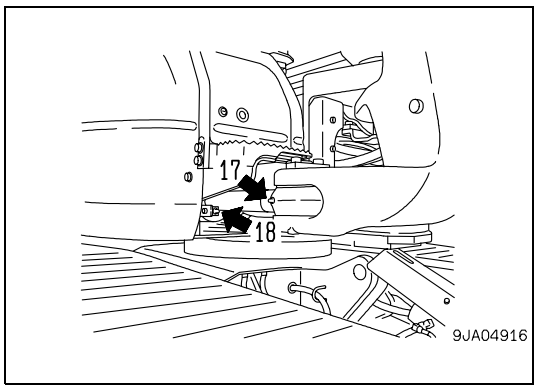
(12) Articulation coupling pin (2 points)
(13) Bucket cylinder rod end pin (1 point)
(14) Articulation-bucket connection pin (2 points)
(15) Arm-bucket coupling pin (1 point)



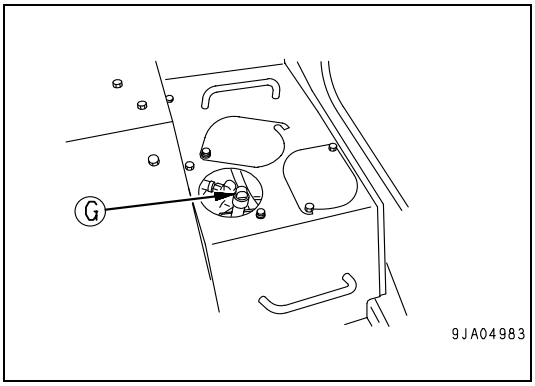
(16) Boom swing support pins (2 points)



(17) Boom swing cylinder rod end pin (1 point)
(18) Boom swing cylinder base pin (1 point)



4.9.7.b CHECKING THE OIL LEVEL IN THE SWING REDUCTION GEAR AND TOPPING UP

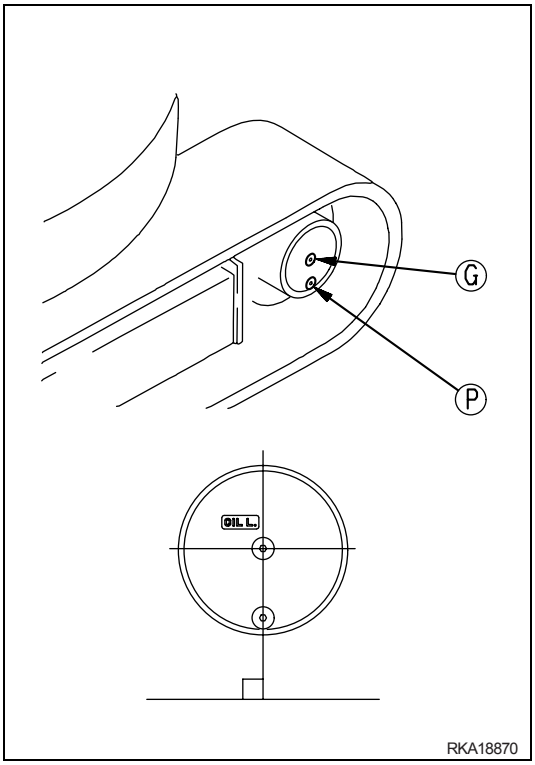


WARNING

- **Soon after the machine has been stopped, the engine oil is very hot and may cause burns; let the oil cool down to 40÷45° C before carrying out any check.**

1. The operation must be carried out with the machine positioned on firm and level ground.
2. The oil level must be checked on the dipstick (G) and must be included between the H and L marks; if this is not the case, top up by proceeding as explained in paragraph "4.9.10.a CHANGING THE OIL IN THE SWING REDUCTION GEAR" and using the oil recommended in the lubricant chart (see "4.4 FUEL, COOLANT AND LUBRICANTS").

4.9.7.c CHECKING THE OIL LEVEL IN THE FINAL REDUCTION GEARS AND TOPPING UP



WARNING

- **Soon after the machine has been stopped, the engine oil is very hot and may cause burns; let the oil cool down to 40÷45° C before carrying out any check.**
- **Loosen the cap slowly to release any residual pressure.**

1. The operation must be carried out with the machine positioned on firm and level ground. The check must be carried out on each reduction gear, with the drain plug (P) in low position and perpendicular to the ground. If necessary, move the machine slightly until reaching the specified position, which is indispensable for an accurate check.
2. This is a visual check and serves to make sure that the lubricant reaches the height of the hole (G); if this is not the case, top up by proceeding as explained in paragraph "4.9.10.b CHANGING THE OIL IN THE FINAL REDUCTION GEARS" and using the oil prescribed in the lubricant chart (see "4.4 FUEL, COOLANT AND LUBRICANTS").

4.9.7.d CHECKING THE BATTERY CHARGE LEVEL

⚠ WARNING

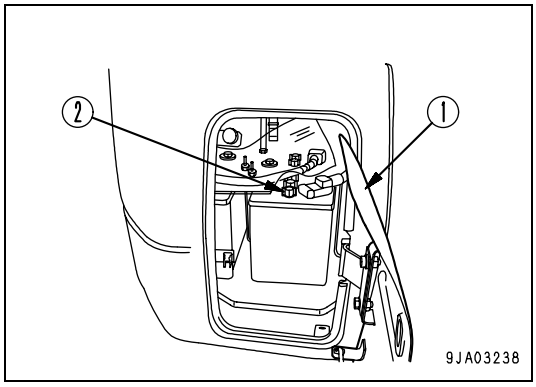
- **Check the charge level only with the engine at rest.**
- **To prevent gas explosions, do not use naked flames, do not smoke and avoid producing sparks due to short circuits.**
- **The battery electrolyte is dangerous; in case of contact with the eyes or skin, rinse with plenty of water and consult a doctor without delay. The battery is maintenance-free.**

IMPORTANT

- **Make sure that the connection terminals are not oxidized; if necessary, clean them and cover them with anti-oxidation grease.**

The battery (2) can be reached after opening the inspection cover (1). A visual gauge indicates the battery charge level in different colours, according to the table positioned beside the gauge:

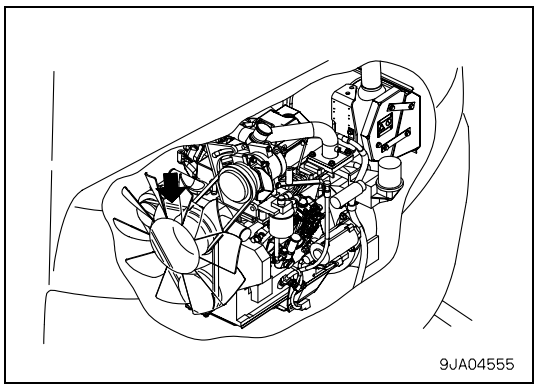
- Green: optimal charge
- Gray: the battery needs recharging
- White: the battery must be replaced.



⚠ WARNING

- **If a dry battery is used, check that the electrolyte level is approximately 6 mm above the plate edge; if necessary, top up using distilled water only.**
  If, on the contrary, the level is low because some fluid has been spilled, add sulphuric acid, after diluting it to reach the concentration suitable for the ambient temperature (see "3.5.1.3 BATTERY").
- **It is advisable to add distilled water just before starting work, in order to prevent if from freezing.**
- **Before putting back the cell caps, make sure that the breather holes are not clogged.**

4.9.7.e CHECKING AND ADJUSTING THE FAN BELT TENSION



⚠ WARNING

- **Soon after the machine has been stopped, the engine is very hot and may cause burns; let the engine cool down before carrying out any check.**

CHECK

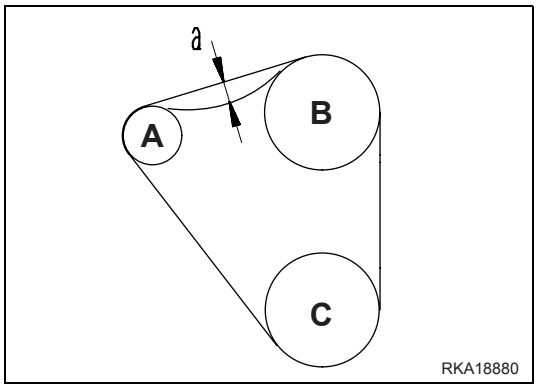
The fan belt can be reached after opening the engine hood (see "3.2.9 ENGINE HOOD").

1. The check is manual: press the belt with one thumb on the intermediate point between the alternator pulley (A) and the fan pulley (B), exerting a force equal to 58.8 Nm (6 kgf); the resulting deflection "**a**" must be approximately 8 mm..

   (A) Alternator pulley

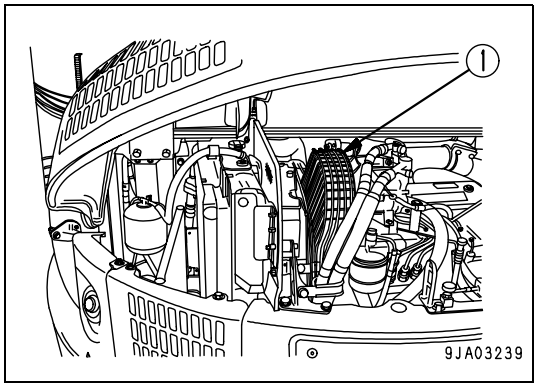
   (A) Fan pulley

   (C) Drive shaft pulley
2. If the deflection exceeds this value, adjust by proceeding as indicated below.



ADJUSTMENT

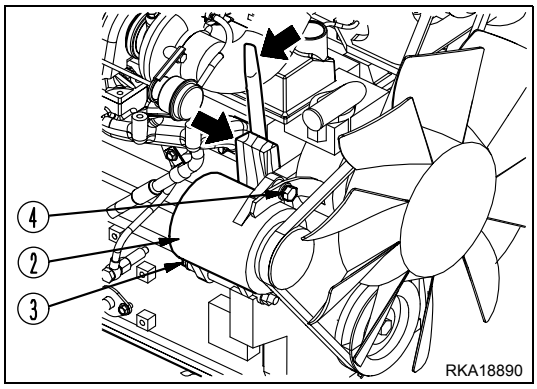
1. Remove the fan guard (1).
2. Insert a lever between the alternator (2) and the engine block and a wooden block between the lever and the alternator to avoid damaging the latter (2).
3. Loosen the fastening screws (3) and the adjusting screw (4).
4. Push the alternator (2) towards the front of the machine, so that the belt deflection is approximately 8 mm (approx. 58.8 N - 6 kgf).
5. Tighten the adjusting screw (4) and the fastening screw (3).



IMPORTANT

- **If the belt is worn or in case of doubt on its conditions, change it and check the tension again after a few hours of operation.**

6. Put back the fan guard (1).



4.9.7.f CHECKING AND ADJUSTING THE AIR CONDITIONER COMPRESSOR BELT TENSION

(If installed)

⚠ WARNING

- **Soon after the machine has been stopped, the engine is very hot and may cause burns; let the engine cool down before carrying out any check.**
- **The coolant used in the air conditioning system is very dangerous. If it is sprayed into the eyes or in case of contact with the skin, it may cause blindness or frostbite. To avoid any explosion, do not generate sparks and do not use naked flames near the air conditioner.**
- **The adjustment of the belt tension is a mechanical operation and must be carried out without working on the air conditioning system.**

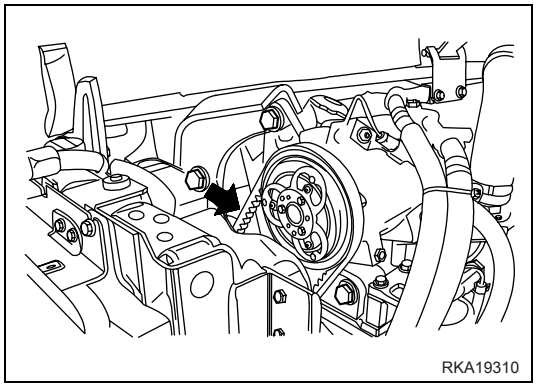
CHECK

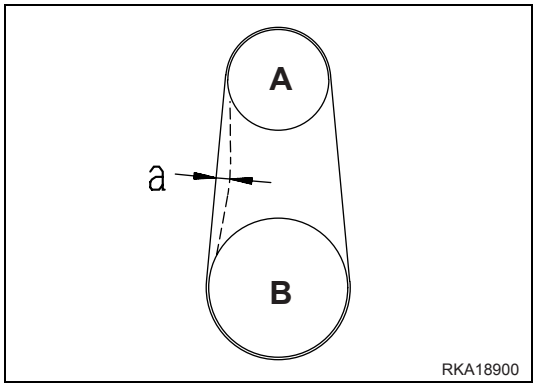
The compressor belt can be reached after opening the engine hood (see "3.2.9 ENGINE HOOD").

1. The check is manual: press the belt with one thumb on the intermediate point between the compressor pulley (A) and the fan pulley (B), exerting a force equal to 58.8 Nm (6 kgf); the resulting deflection "**a**" must be approximately 10-12 mm..

   (A) Compressor pulley

   (A) Fan pulley
2. If the deflection exceeds this value, adjust by proceeding as indicated below.



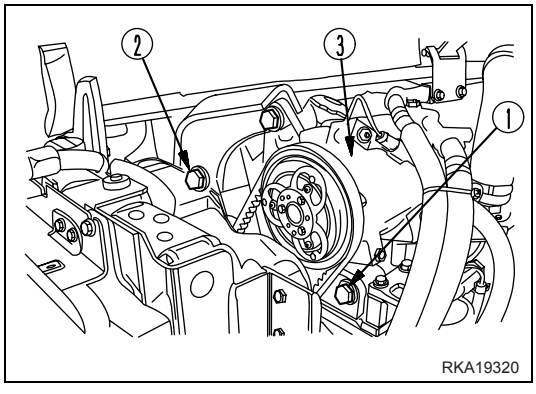


ADJUSTMENT

1. Loosen the screws (1) and (2).
2. Insert a lever between the compressor (3) and the engine block and push the compressor towards the outside of the machine, so that the belt deflection is approximately 10-12 mm (approx. 58.8 N or 61 kgf).
3. Tighten the screws (1) and (2) to fix the compressor.

IMPORTANT

- **If the belt is worn or in case of doubt on its conditions, change it and check the tension again after a few hours of operation.**



4.9.8 MAINTENANCE AFTER THE FIRST 500 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

The following maintenance operation must be carried out after the first 500 hours of operation, together with those to be performed “EVERY 500 HOURS”.

a - CHANGE THE HYDRAULIC OIL AND CLEAN THE INTAKE FILTER

For further details, see paragraph “EVERY 2000 HOURS”.

4.9.9 MAINTENANCE EVERY 500 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50 HOURS and every 100 HOURS.

4.9.9.a CHANGING THE FUEL FILTER CARTRIDGE

⚠ WARNING

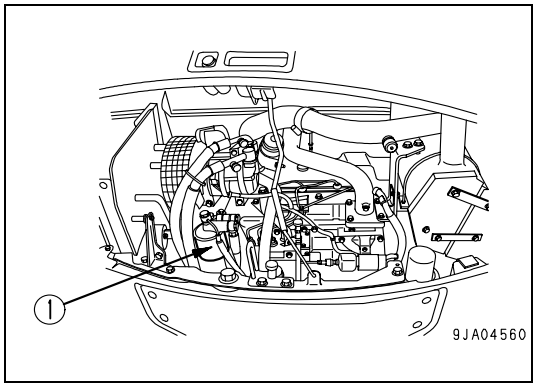
- **Change the filtering element after work, when the engine has cooled down to 40÷45°C.**
- **During these operations some fuel may be spilled; clean the dirty areas immediately, in order to prevent any risk of slipping or fire.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

⚠ CAUTION

- **On new machines change the fuel filter cartridge after the first 250 hours of operation and successively every 500 hours.**

FUEL FILTER

1. Put a cloth under the filter cartridge.
2. Using a filter wrench, turn the cartridge (1) anticlockwise to remove it.
3. Clean the filter housing, fill a new cartridge with clean fuel, cover the surface of the gasket with engine oil, then install the cartridge on the filter housing.
4. Tighten the cartridge until the gasket makes contact with the sealing surface, then give a further 2/3 turn.



IMPORTANT

- **Do not use the wrench to lock the filter, in order to avoid damaging the filter itself and causing fuel leakages.**

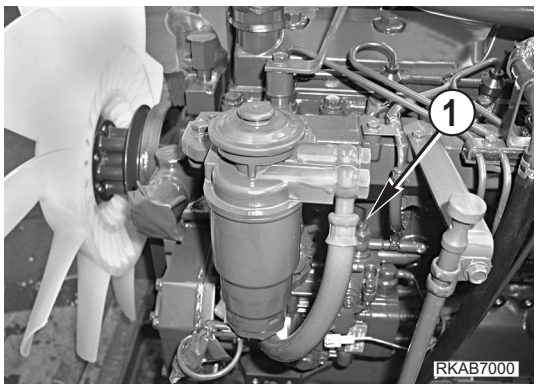
5. After changing the fuel filter cartridge, bleed the circuit. For details on this operation, see "4.9.9.a pos. BLEEDING THE CIRCUIT".
6. After changing the cartridge, start the engine and make sure that there are no infiltrations of fuel through the filter gasket. In case of leakages, check the tightening of the cartridge and if necessary tighten it again. If the leakages persist, carry out steps 1 and 2 to remove the cartridge, then check if the surface of the gasket is damaged or dirty with foreign matter. If the gasket is damaged or dirty with foreign matter, change it and then repeat steps from 3 to 6.

BLEEDING THE CIRCUIT

1. Fill the fuel tank.
2. Loosen the drain screw (1) until no more air is present in the fuel that flows out.
3. Tighten the screw (1).

IMPORTANT

- **When all the fuel in the tank has run out, bleed the circuit by proceeding as described above.**



4.9.9.b CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER CARTRIDGE

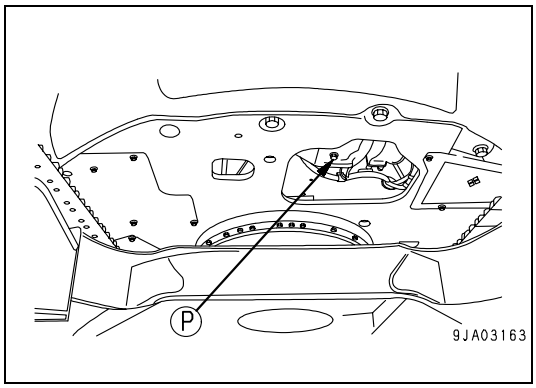
⚠ WARNING

- **Change the oil with the machine parked on a level surface and the work equipment resting on the ground.**
- **Soon after the machine has been stopped the engine oil is very hot and may cause burns; let the engine cool down until it reaches a temperature of 40÷45°C before draining the oil.**
- **The oil that may be spilled during the oil change will make the ground slippery: use anti-slip shoes and immediately remove any trace of oil from the floor.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

⚠ CAUTION

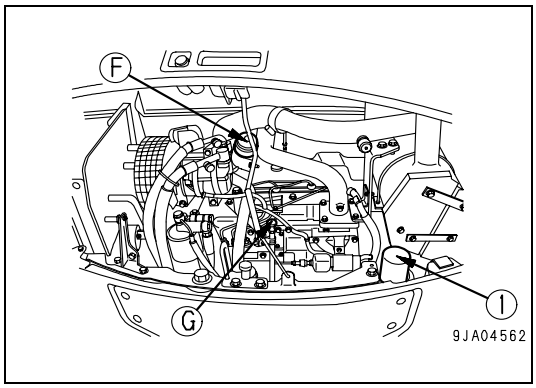
- **On new machines change the engine oil and the engine oil filter cartridge after the first 250 hours of operation and successively every 500 hours.**

1. Open the engine hood (see "3.2.9 ENGINE HOOD").
2. Remove the drain plug (P) of the engine oil pan, gathering the used oil that flows out of it into a container with suitable capacity.
   While the oil flows out, remove the filler cap (F), so that the oil can flow out freely.
3. Check the used oil and if there are many metal particles or foreign bodies, contact your Komatsu Dealer.
4. Put back the drain plug (P).
5. Using a filter wrench, turn the filter (1) anticlockwise to remove it.



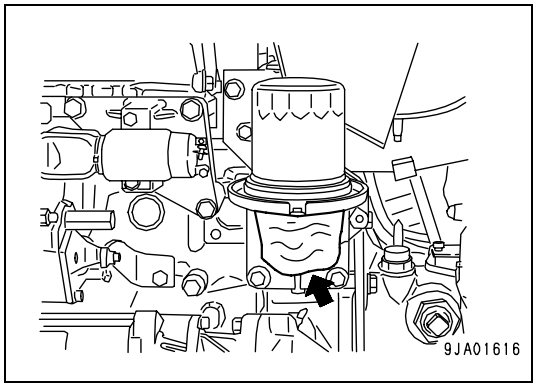
NOTE
- Position a cloth in contact with the cut part of the oil container guide. This allows the area around the filter housing to be kept clean.

6. Clean the filter housing, cover the threading and the gasket of the new cartridge with new engine oil (or with a thin layer of grease), then install it.



NOTE
- Make sure that there are no residues of the previous gasket attached to the filter housing, since this may cause oil leakages.

7. During installation, make the gasket come in contact with the sealing surface of the filter housing, then give a further 1/2 turn.



8. After changing the filter cartridge, add engine oil through the filler neck (F), until reaching a level included between the H and L marks on the dipstick (G).
   To top up, use oil suitable for the ambient temperature (see "4.4 FUEL, COOLANT AND LUBRICANTS").
9. Put back the filler cap (F), start the engine and stop it after 5 minutes.
   Check the level again and top up, if necessary.
10. Close the engine hood.

Start the engine, make sure that there are no leakages and that the engine oil pressure warning light goes out.

IMPORTANT

- **Do not use the wrench to lock the filter, in order to avoid damaging the filter itself and causing oil leakages.**

4.9.9.c CHANGING THE HYDRAULIC OIL FILTER CARTRIDGE

⚠ WARNING

- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before changing the filter.**
- **The hydraulic system is under pressure; slowly loosen the filler cap to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

⚠ CAUTION

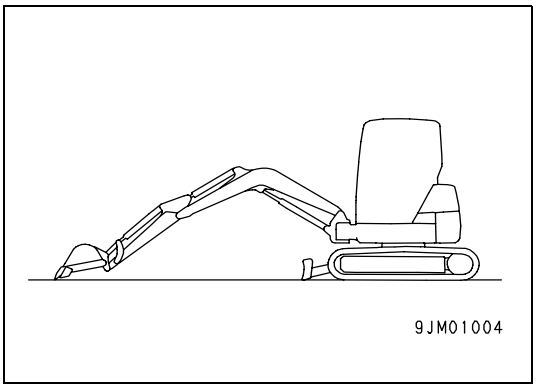
- **On machines containing synthetic biodegradable oil type HEES , this must be changed for the first time after the first 50 hours of operation and successively every 500 hours.**

IMPORTANT

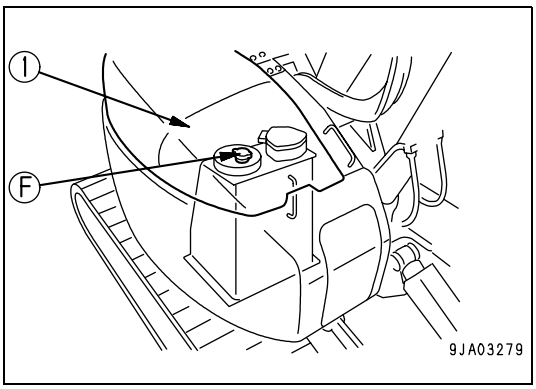
- **If the machine is equipped with demolition hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

The filter is positioned on the hydraulic system drain outlet and it holds the metal particles that come off the various components due to wear. The filter can be reached after opening the side cover (1).
To replace the filter, proceed as follows:

1. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
2. Lower the blade to the ground.
3. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).



4. Open the side cover (1) and slowly loosen the filler cap (F) to release any residual pressure from the tank.

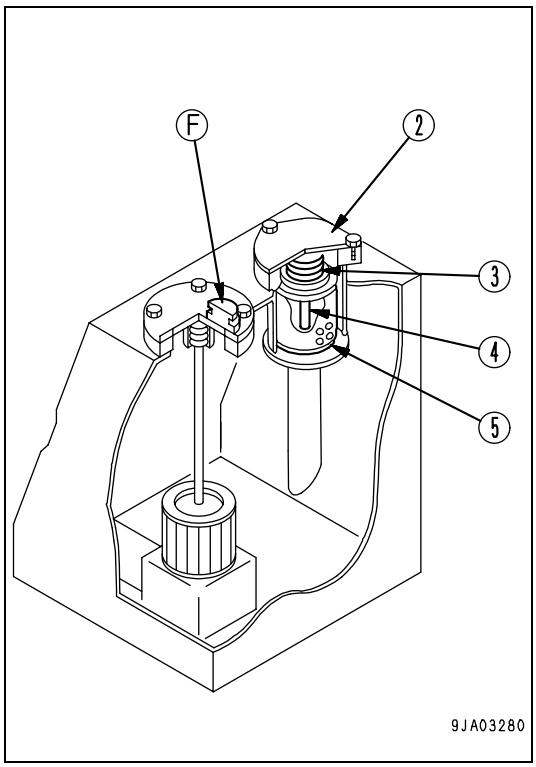


5. Loosen the two screws (2) and remove the triangular cover (3). During this operation, be careful to the thrusting force of the spring (3).
6. Remove the spring (3), the valve (4) and extract the cartridge (5).
7. Carefully clean the filter casing and change the cartridge (5).
8. Reassemble the whole by proceeding in the reverse order and make sure that the gasket of the cover (2) is not damaged and is correctly housed in its seat.
9. Install the oil filler cap (F) and close the side cover (1).
10. Start the engine and let it idle for at least 10 minutes in order to bleed the circuit.

NOTE

- After stopping the engine, wait at least 5 minutes in order to eliminate all the air bubbles from the oil present in the tank.

11. Check for oil leakages and remove any oil that has been spilled.



4.9.9.d CLEANING THE INSIDE AND OUTSIDE FILTERS OF THE AIR CONDITIONER

⚠ WARNING

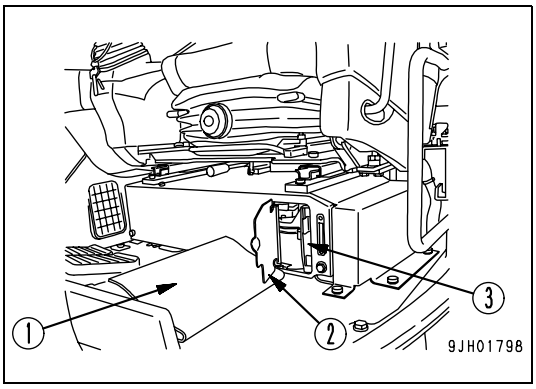
- **When compressed air is used to clean the filter, dust may get into the eyes. Wear safety goggles and a dust mask during the cleaning operations.**

IMPORTANT

- **If the machine is used in particularly dusty places, shorten the maintenance intervals and clean the filter more frequently.**
- **When washing the floor, take care to avoid wetting the filtering element.**

CLEANING THE AIR FILTER

1. Roll the mat (1) on the front left side of the cab floor, then open the door (2).
2. Extract the inner filter (3).
3. Clean the inner filter (3) with compressed air. If there is oil on the filter or if it is very dirty, wash it with a neutral detergent. After washing the filter, dry it completely before use.



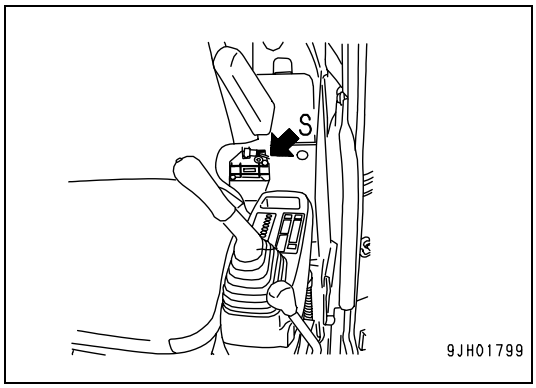
IMPORTANT

- **If the filtering element is excessively clogged or damaged, change it with a new one.**

4. Install the cleaned filter (3), close the door (2) and lay the mat (1) on the floor.

CLEANING THE EXTERNAL AIR FILTER

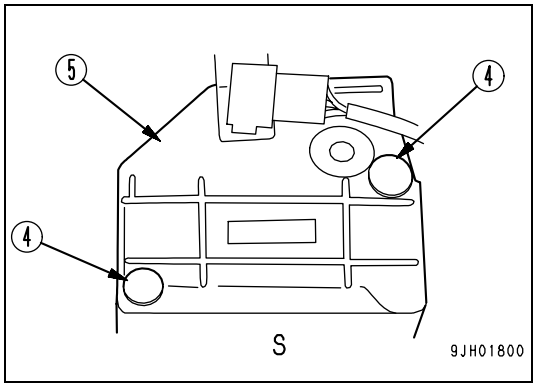
1. Lift the retainer (4) of the air intake duct on the rear left side of the operator seat. The cover (5) will be automatically released.
2. Pull the filter (6) upwards.
3. Clean the filter (6) with compressed air. If there is oil on the filter or if it is very dirty, wash it with a neutral detergent. After washing the filter, dry it completely before use.



IMPORTANT

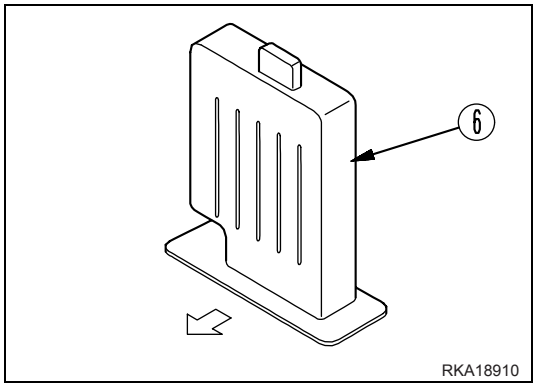
- **If the filtering element is excessively clogged or damaged, change it with a new one.**

4. Install the cleaned filter (6) and fix the cover (5).



IMPORTANT

- **Insert the filter (6), paying special attention to the upper and lower sides.**



4.9.9.e CHECKING AND CLEANING THE FINS OF THE RADIATOR, THE HEAT EXCHANGER AND THE CONDENSER

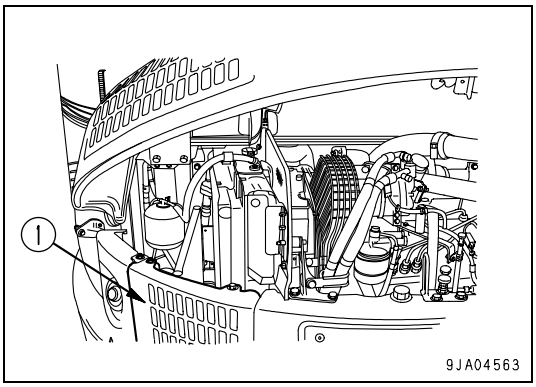
⚠ WARNING

- **If compressed air, steam or water hit someone, they may cause serious injury. Always wear a visor and safety shoes.**

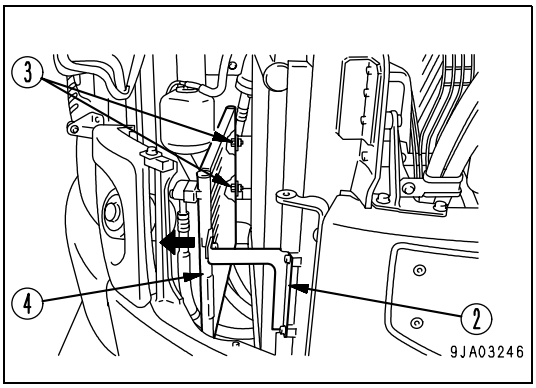
IMPORTANT

- **When using compressed air, always keep the nozzle at a safety distance, in order to avoid damaging the fins. If the fins are damaged, they may cause water leakages or overheating.**
- **Do not use products containing even a slight quantity of oily substances, since these facilitate the adhesion of dust, which affects the heat exchange adversely.**
- **Carry out this cleaning operation whenever the radiator, the condenser or the heat exchanger are accidentally dirtied with oil, diesel oil or greasy or oily substances.**
- **If the machine is used in dusty places, clean the radiator, the condenser and the heat exchanger more frequently, in order to prevent the fins from clogging.**

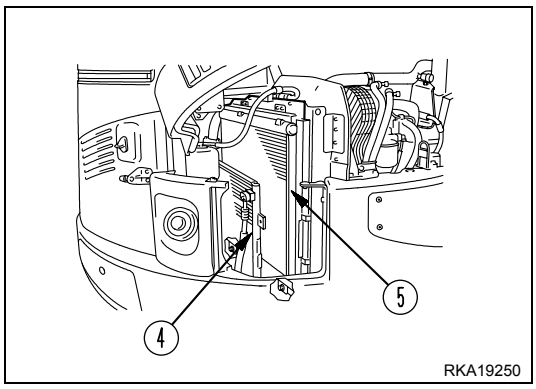
1. Open the engine hood.
2. Remove the cover (1).



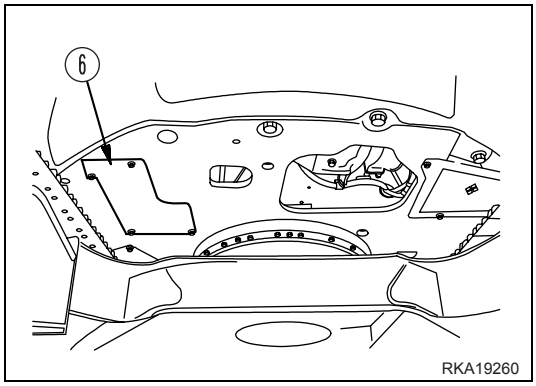
3. Remove the bracket that fastens the condenser (2).
4. Loosen the fastening bolts (3) positioned in the inner part of the condenser and incline it (4).



5. Direct a jet of compressed air on the radiator fins (5) and the condenser fins (4) to remove dirt, dust and any residues of dry leaves. It is possible to use steam or water instead of compressed air.

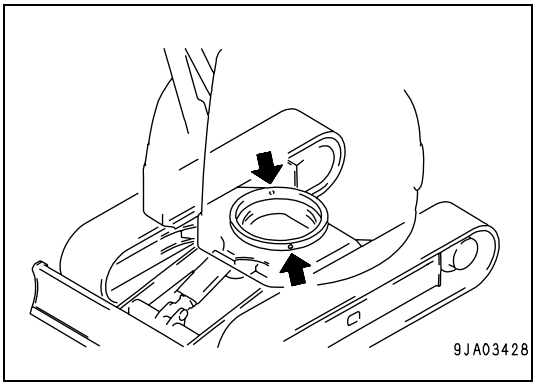


6. Remove the intermediate cover (6) and eliminate any dirt, dust and residues of dry leaves that may have fallen on the bottom.



7. Check the rubber pipe. If the pipe is broken or too hard due to the prolonged use, change it.
   Check if the pipe clamps are loose.
8. Put back all the parts that have been removed, making sure to place them in their original positions.

4.9.9.f LUBRICATING THE SWING BALL-BEARING RING

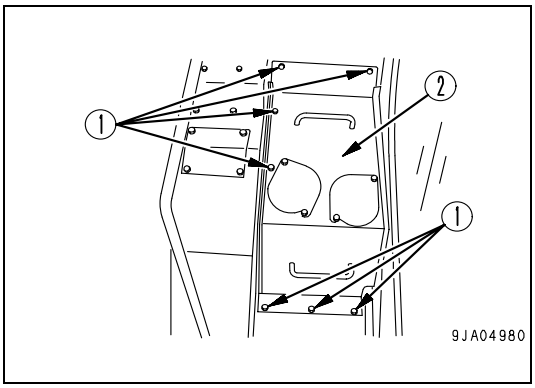


This maintenance operation must be carried out with the work equipment resting on the ground.
The lubrication must be carried out after thoroughly cleaning the grease nipples, by applying the grease pump filled with the prescribed grease, (see "4.4 FUEL, COOLANT AND LUBRICANTS").
Once the lubrication procedure has been completed, make sure that all the points have been lubricated and remove the used grease that has spread out of the ball-bearing ring.

IMPORTANT

- **It is advisable to inject grease in all the grease nipples (no. 2 arranged to form an angle of 180°), in order to obtain a correct distribution and a sufficient quantity of new grease.**

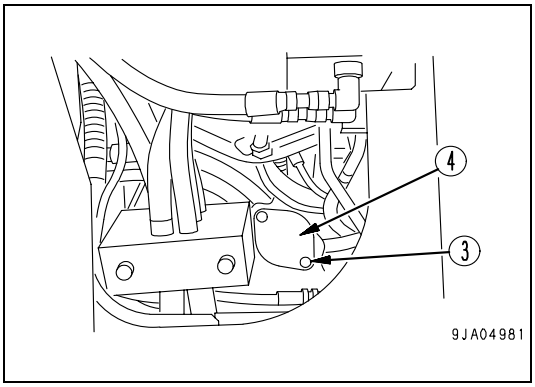
4.9.9.g CHECKING THE GREASE LEVEL IN THE BALL-BEARING RING PINION AND TOPPING UP



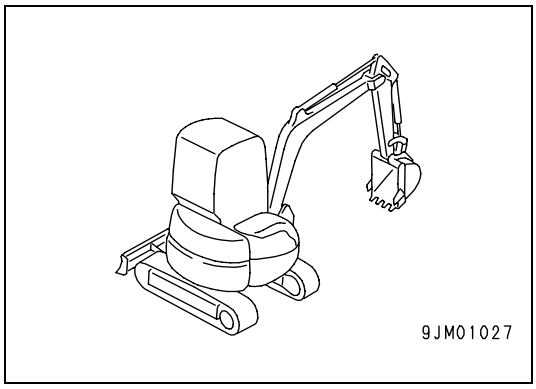
⚠ WARNING

- **Carry out this check with the machine at rest, on a level surface and at the end of work, that is, at operating temperature.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

1. Loosen the screws (1) and remove the cover (2).
2. Loosen the screws (3) on the top of the turret and remove the cover (4).
3. Check the grease.
4. If the grease is milky white, change it. To carry out this operation, contact your Komatsu Dealer.
   The total quantity of grease is 5.5 l (5 kg).
5. Install the grease filling cover (4) and the cover (2).

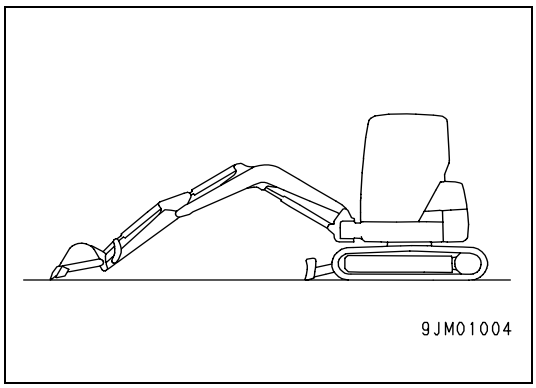


4.9.9.h DRAINING THE HYDRAULIC OIL TANK (Only for machines in which synthetic biodegradable oil type HEES is used)

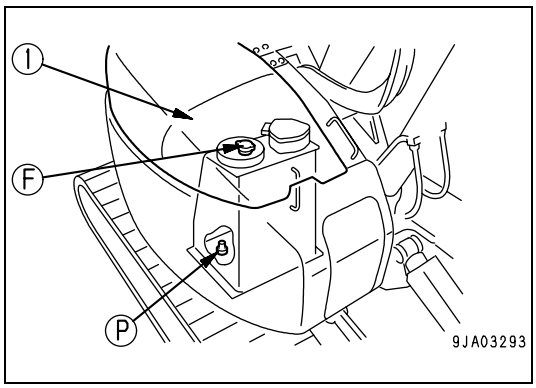


⚠ WARNING

- **Retract the arm and bucket cylinders completely, rest the bucket teeth on the ground and, after stopping the engine, eliminate the residual pressures from the equipment (by shifting the controls more than once) and from the tank (by slowly loosening the filler cap).**
- **Let the oil cool down until it reaches 40÷45°C before carrying out this maintenance operation.**
- **Immediately clean any area dirty with oil.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**



1. Turn the turret so that the lower part of the hydraulic oil tank is not covered by the tracks.
2. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
3. Lower the blade to the ground.
4. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).
5. Open the side cover (1) and slowly loosen the filler cap (F) to release any residual pressure from the tank.
6. Remove the drain plug (P) and let all the condensate flow out of the tank. Collect the condensate in a container with suitable capacity.
7. Put back the filler cap (F).
8. Close the side cover.



IMPORTANT

- **The tank must be drained before starting the engine, with temperatures exceeding 0°C; when the temperature is below 0°C, the tank must be drained at the end of work or in any case with the machine at operating temperature, to prevent the condensate from freezing.**

4.9.10 MAINTENANCE EVERY 1000 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50, 100, 250 and 500 HOURS.

4.9.10.a CHANGING THE OIL IN THE SWING REDUCTION GEAR

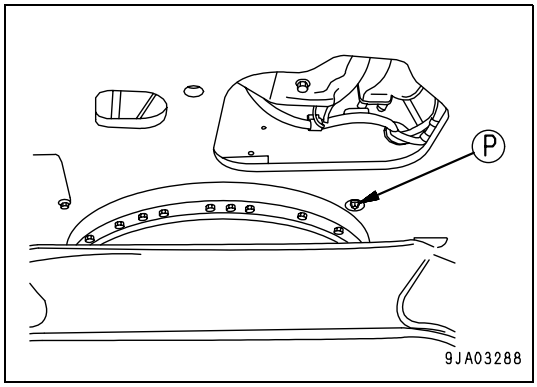
⚠ WARNING

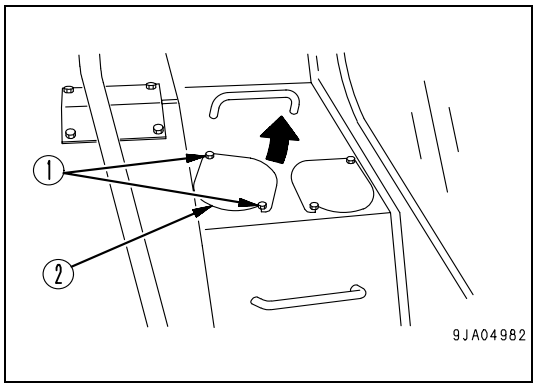
- **As soon as the machine has been stopped the oil is very hot and may cause burns; let the oil cool down until reaching 40÷45°C before changing it.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

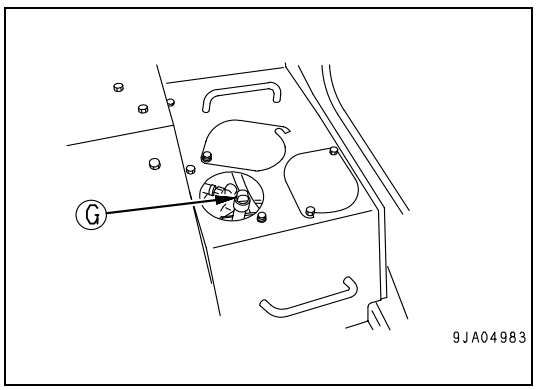
This operation must be carried out with the machine positioned on level ground and at a temperature of 40-45°C, so that the oil becomes fluid and can easily be drained, which facilitates the elimination of any suspended solid particles.

- Filling capacity: 2.0 l

1. Remove the drain plug (P) and let the used oil flow out completely, gathering it into a container with suitable capacity.
2. Loosen the screws (1) and make the cover (2) slide.
3. Remove the dipstick (G).
4. Once the oil has been drained, put back the plug (P) and pour oil of the prescribed type through the hole (G), until reaching a level included between the H and L marks on the dipstick (G).
5. Put back the dipstick (G) and close the cover (2).
   Swing the turret more than once, then stop the machine and check the level again.
   Use oil of the prescribed type. (See "4.4 FUEL, COOLANT AND LUBRICANTS").







4.9.10.b CHANGING THE OIL IN THE FINAL REDUCTION GEARS

⚠ WARNING

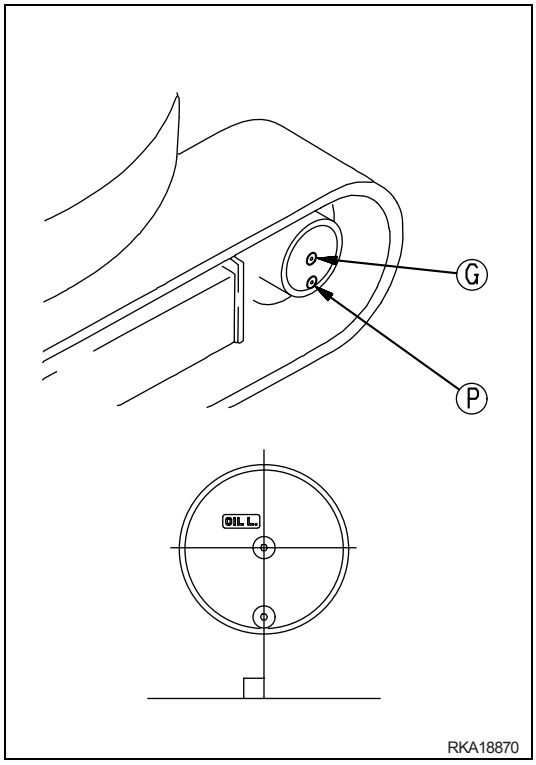
- **As soon as the machine has been stopped the oil is very hot and may cause burns; let the oil cool down until reaching 40÷45°C before changing it.**
- **Loosen the cap slowly to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

This operation must be carried out on each reduction gear with the machine parked on level ground and at a temperature of 40-45°C, so that the oil becomes fluid and can be drained easily, which facilitates the elimination of any suspended solid particles.

- Filling capacity (of each reduction gear): 1.3 l

1. Move the machine until the drain plug (P) is in low position and perpendicular to the ground.
2. Remove the drain plug (P) and let the used oil flow out completely, gathering it into a container with suitable capacity. While the oil flows out, remove the level plug (G).
3. Once the oil has been drained, put back the plug (2) and pour oil of the prescribed type through the hole (G), until reaching the lower edge of the hole itself.
4. Put back the plug (G).

Carry out some forward and backward movements, stop the machine and check the levels again. Always use oil of the prescribed type (see "4.4 FUEL, COOLANT AND LUBRICANTS").



4.9.10.c CHANGING THE HYDRAULIC OIL FILTER CARTRIDGE IN THE WORK EQUIPMENT LINE (if installed)

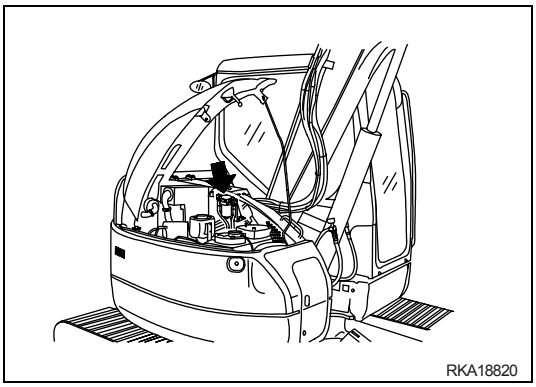
⚠ WARNING

- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before changing the filter.**
- **The hydraulic system is under pressure; slowly loosen the filler cap to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

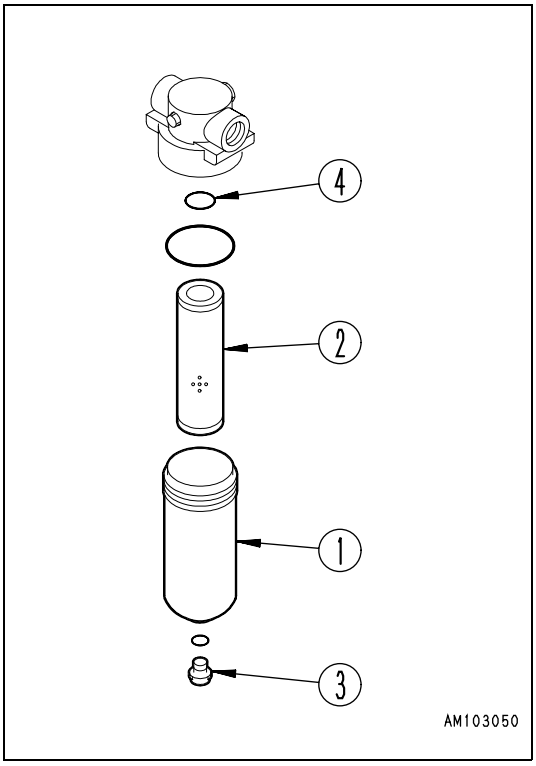
IMPORTANT

- **If the machine is equipped with demolition hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

1 - Open the side cover and position a container under the filter cartridge to collect the oil.


RKA18820

2 - Rotate the filter body (1) to the left to remove it, then extract the cartridge (2).
3 - Remove the plug (3) from the filter body (1).
4 - Clean the components that have been removed, then install a new cartridge (2) and the O ring (4).
5 - During installation, make the filter body come into contact with the filter housing, then give a further 1/2 turn.



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4.9.11 MAINTENANCE EVERY 2000 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50, 100, 250, 500 and 1000 HOURS.

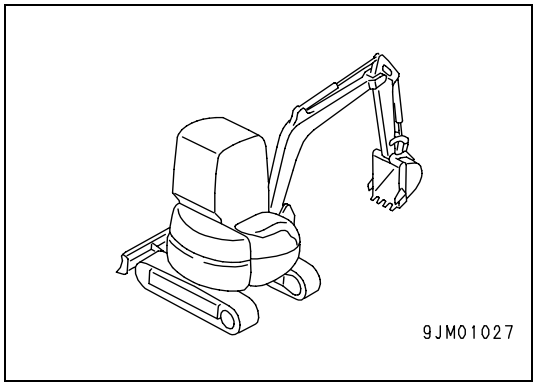
4.9.11.a CHANGING THE HYDRAULIC OIL AND CLEANING THE INTAKE FILTER (Only for machines in which synthetic biodegradable oil HEES is used)

⚠ WARNING

- **Retract the arm and bucket cylinders completely, rest the bucket teeth on the ground and, after stopping the engine, eliminate the residual pressures from the equipment (by shifting the controls more than once) and from the tank (by slowly loosening the filler cap).**
- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before carrying out this maintenance operation.**
- **Immediately clean any area dirty with oil.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

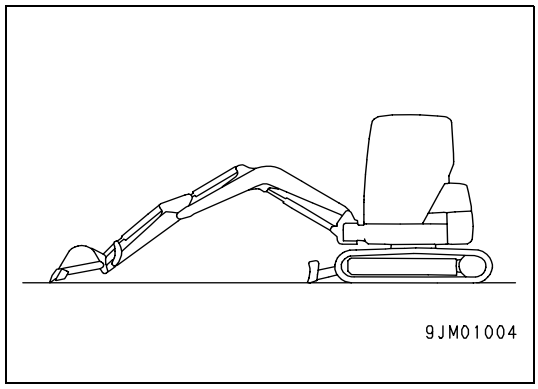
⚠ CAUTION

- **It is not possible to mix the synthetic biodegradable oil type HEES with ordinary hydraulic oils, since when the temperature increases insoluble compounds are generated, which deposit on the filters and clog them (the maximum concentration of ordinary oil must not exceed 1% of the total quantity of oil).**
- **Biodegradable oil can be used only in the hydraulic system; it cannot be used for the engine, the transmissions, the braking system, etc.**
- **On new machines the oil must be changed after the first 500 hours of operation and successively every 2000 hours, and in any case at least once a year.**



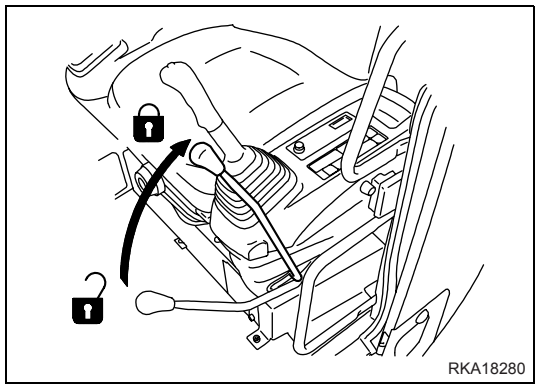
IMPORTANT

- **If the machine is equipped with hydraulic hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

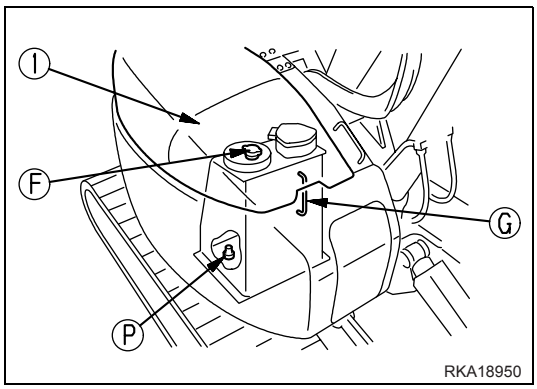


- Filling capacity: 64 l

1. Turn the turret so that the lower part of the hydraulic oil tank is not covered by the tracks.
2. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
3. Lower the blade to the ground.
4. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).
5. Shift the safety lever to the “locked” position (L).



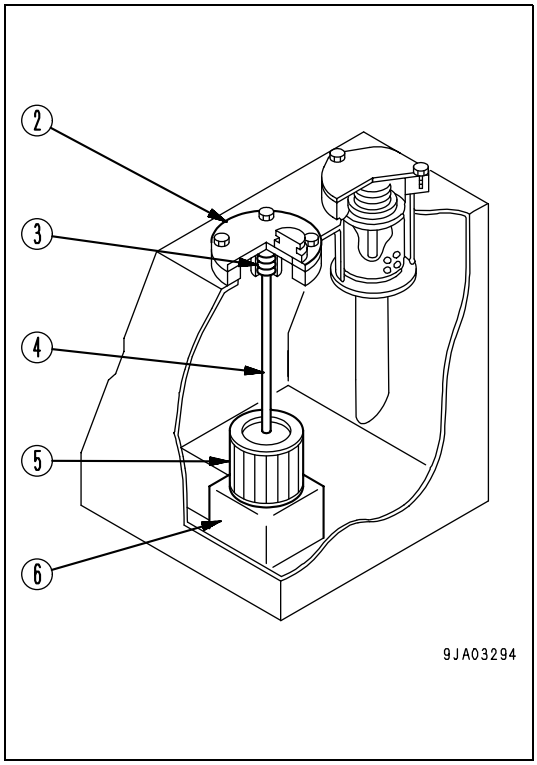
6. Open the side cover (1) and slowly loosen the filler cap (F) to release any residual pressure from the tank.
7. Remove the drain plug (P) and let the oil flow out, gathering it into a container with suitable capacity.
8. Loosen the two screws (2) and remove the triangular cover (3). During this operation, be careful to the thrusting force of the spring (3).
9. Remove the rod (4), the spring (3) and the filter (5).
10. Remove any dirt from the filter (5), then wash it with clean diesel oil or wash oil.



IMPORTANT

- **Carefully check the filtering element grid and if it is not in perfect conditions, change it.**

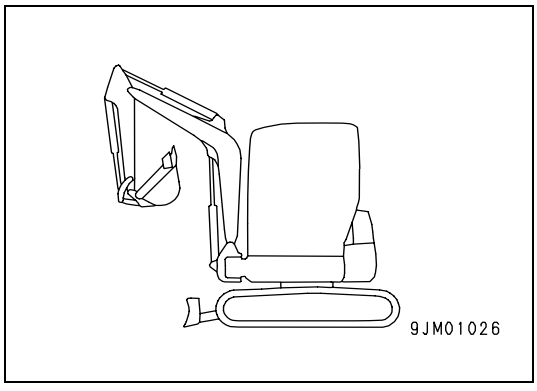
11. Insert the filter (5) in the protruding part of the tank (6) and reassemble the whole by proceeding in the reverse order, making sure that the gasket of the cover (2) is not damaged and is correctly housed in its seat in the tank.
12. Put back the drain plug (P) and add oil through the filler neck (F) until reaching a level included between the H and L marks on the gauge (G) (see "3.3.2.4 CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP")..
    Use only synthetic biodegradable hydraulic oil type HEES (see "4.4.1 APPROVED SYNTHETIC BIODEGRADABLE LUBRICANTS TYPE HEES").
13. Move the boom to a central position and extend the boom, arm and bucket cylinders completely, as shown in the diagram on the right, then remove the filler cap (F).
    Put back the cap and pressurize the tank, lowering the equipment to the ground.



IMPORTANT

- **Make sure that the hydraulic tank is pressurised. If the tank isn't under pressure, the pump will suck in air and this will damage the equipment.**

16. Make sure that all the control levers are in neutral position and let the engine idle for at least 2÷3 minutes before operating the work equipment.
    Move each piston more than once to deaerate the system; check and top up if necessary.
    For details on the bleeding procedure, see "4.9.1.o BLEEDING THE HYDRAULIC SYSTEM".



⚠ CAUTION

- **Do not start the engine with empty tank, since this would certainly damage the pump.**

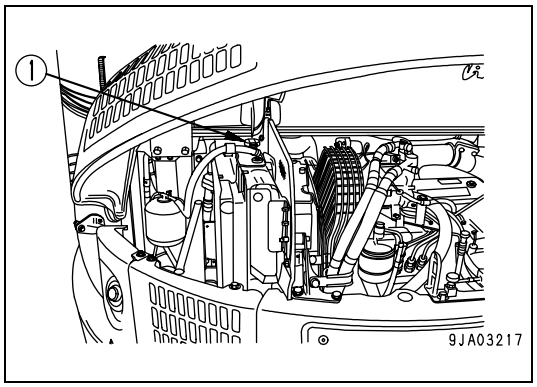
4.9.11.b CHANGING THE COOLANT

⚠ CAUTION

- **The coolant must be changed every 2000 hours of operation or every 2 years, whichever occurs first.**

⚠ WARNING

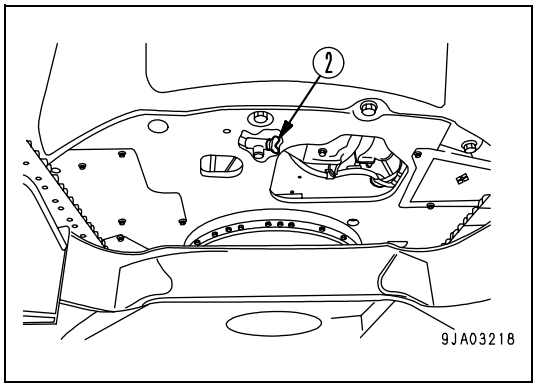
- **Soon after the machine has been stopped the coolant is very hot and under pressure and it may cause serious burns; let the engine cool down until it reaches approximately 40÷45°C before changing the coolant.**
- **Slowly loosen the radiator cap, in order to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

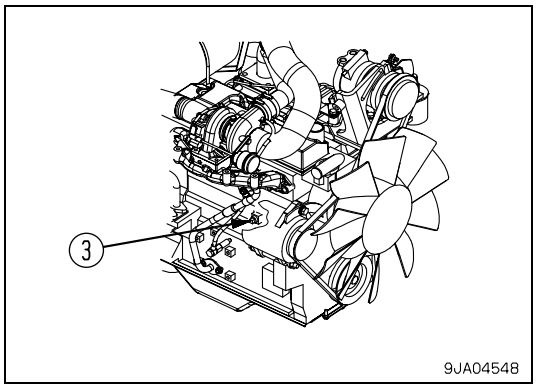


IMPORTANT

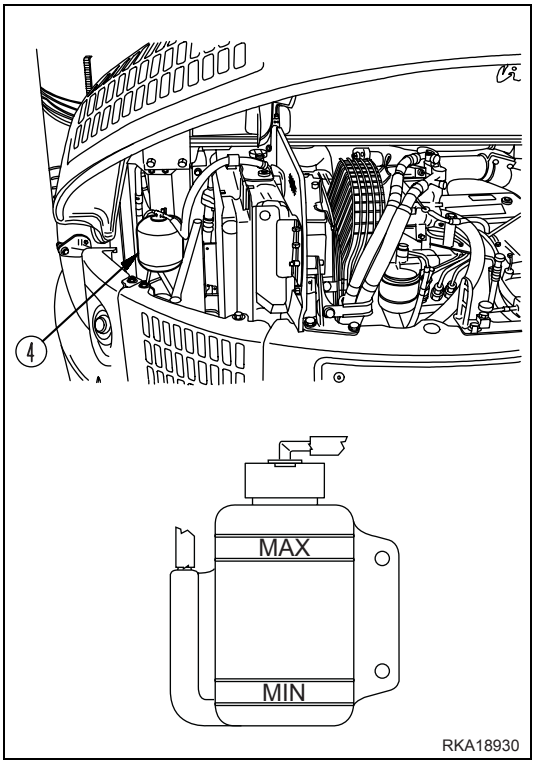
- **The change of the permanent coolant does not require any washing cycle for descaling the circuit.**

1. Open the engine hood. For details, see paragraph "3.2.9 ENGINE HOOD"
2. Loosen and remove the upper cap (1) of the radiator.
3. Remove the cover under the drain plug.
4. Remove the radiator drain plug (2), remove the drain plug (3) situated on the engine block and let the fluid flow out, gathering it in a container with suitable capacity. Drain the coolant tank (4) while the fluid flows out.
5. Close the drain plug (2), put back the plug (3) on the engine block and fill the radiator with new fluid (see "4.4 FUEL, COOLANT AND LUBRICANTS").
6. Put back the cover under the drain plug.
7. Start the engine and let it run at high idling speed for a few minutes; check the level again and top up before putting back the upper cap (1).





8. Fill the tank (4) until reaching the maximum level (MAX).
9. Close the engine hood.



4.9.11.c CLEANING AND CHECKING THE TURBOCHARGER

To carry out this operation, contact your Komatsu Dealer.

4.9.11.d CHECKING THE ALTERNATOR AND THE STARTER

The brush may be worn or the bearing may be without grease, so contact your Komatsu Dealer, who will provide for the necessary checks or repairs.

If the engine is started frequently, have this check carried out every 1000 hours.

4.9.11.e CHECKING AND ADJUSTING THE ENGINE VALVE CLEARANCE

A special tool is required for removing and adjusting the involved parts. Have this operation performed by your Komatsu Dealer.

4.9.11.f CHECKING THE A/C REFRIGERANT GAS QUANTITY ((only for machines with air conditioner)

⚠ DANGER

- **The refrigerant used in the air conditioning system is very dangerous. If it is sprayed into the eyes or in case of contact with the skin, it may cause blindness or frostbite. To avoid any explosion, do not generate sparks and do not use naked flames near the air conditioner.**
- **Maintenance of the air conditioning system must be carried out exclusively by specialized personnel.**

Specific equipment is required to check the refrigerant gas; have this maintenance operation carried out only by specialized personnel and for this purpose contact your Komatsu Dealer.

4.9.12 MAINTENANCE EVERY 4000 HOURS OF OPERATION

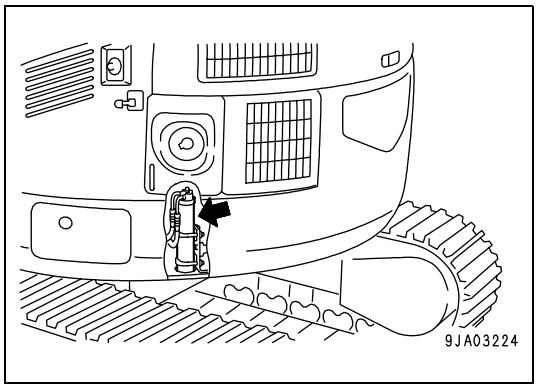
Carry out these operations together with those to be performed every 50, 100, 250, 500, 1000 and 2000 hours of operation.

4.9.12.a CHANGING THE A/C FILTER DRIER (only for machines with air conditioner)

⚠ DANGER

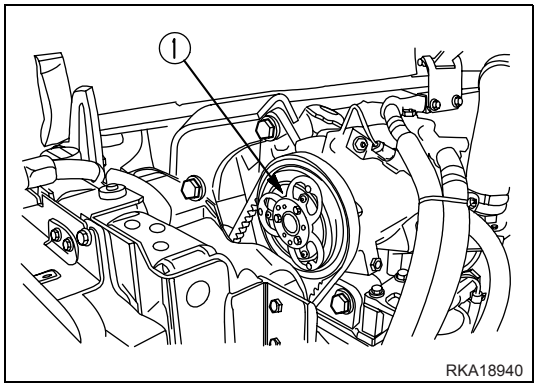
- **The coolant used in the air conditioning system is very dangerous. If it is sprayed into the eyes or in case of contact with the skin, it may cause blindness or frostbite.**
  To avoid any explosion, do not generate sparks and do not use naked flames near the air conditioner.
- **Have the filter drier changed only by specialized personnel and for this purpose contact your Komatsu Dealer.**

The filter must be changed every 4000 hours of operation or every 2 years, whichever occurs first.
The filter must also be changed whenever work in the air conditioning system is performed.



4.9.12.b CHECKING THE OPERATING CONDITIONS OF THE A/C COMPRESSOR (only for machines with air conditioner)

Specific equipment is required to check the operating conditions of the compressor (1); have the compressor checked only by specialized personnel and for this purpose contact your Komatsu Dealer.



4.9.12.c CHECKING THE WATER PUMP

Make sure that the slack in the pulley is not excessive, that the drain hole is not clogged, and check for oil or water leakages. If there is any anomaly, contact your Komatsu Dealer, who will provide for the necessary repairs or changes.

4.9.13 MAINTENANCE EVERY 5000 HOURS OF OPERATION

Carry out these operations together with those to be performed every 50, 100, 250, 500 and 1000 HOURS.

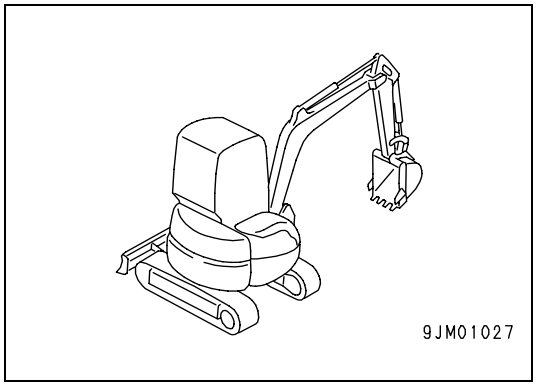
4.9.13.a CHANGING THE HYDRAULIC OIL AND CLEANING THE INTAKE FILTER

⚠ WARNING

- **Retract the arm and bucket cylinders completely, rest the bucket teeth on the ground and, after stopping the engine, eliminate the residual pressures from the equipment (by shifting the controls more than once) and from the tank (by slowly loosening the filler cap).**
- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before carrying out this maintenance operation.**
- **Immediately clean any area dirty with oil.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

⚠ CAUTION

- **On machines containing synthetic biodegradable hydraulic oil type HEES, this must be changed after the first 500 hours of operation and successively every 2000 hours, and in any case at least once a year.**

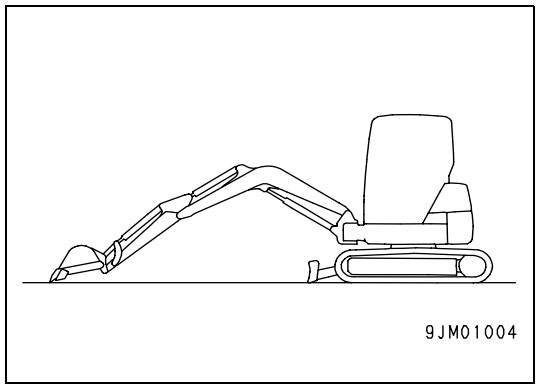


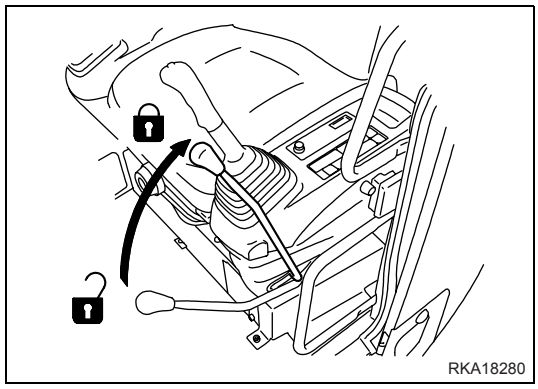
IMPORTANT

- **If the machine is equipped with hydraulic hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

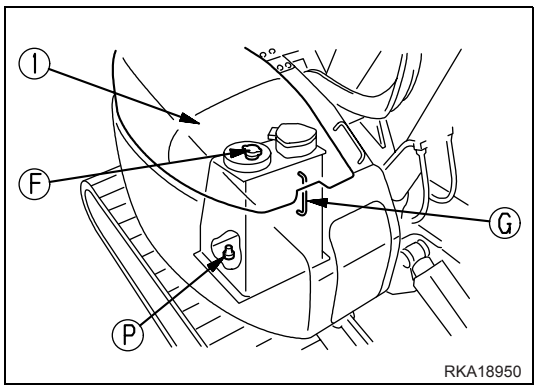
- Filling capacity: 64 l

1. Turn the turret so that the lower part of the hydraulic oil tank is not covered by the tracks.
2. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
3. Lower the blade to the ground.
4. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).
5. Shift the safety lever to the “locked” position (L).





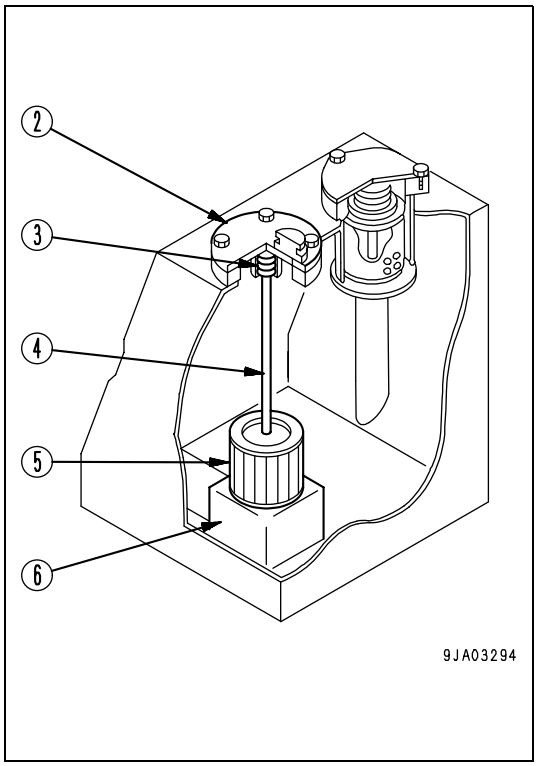
6. Open the side cover (1) and slowly loosen the filler cap (F) to release any residual pressure from the tank.
7. Remove the drain plug (P) and let the oil flow out, gathering it into a container with suitable capacity.
8. Loosen the two screws (2) and remove the triangular cover (3). During this operation, be careful to the thrusting force of the spring (3).
9. Remove the rod (4), the spring (3) and the filter (5).
10. Remove any dirt from the filter (5), then wash it with clean diesel oil or wash oil.



IMPORTANT

- **Carefully check the filtering element grid and if it is not in perfect conditions, change it.**

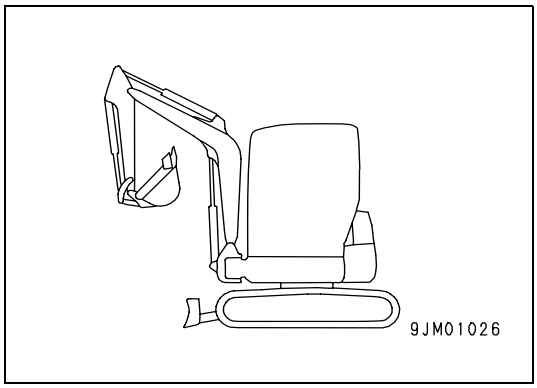
11. Insert the filter (5) in the protruding part of the tank (6) and reassemble the whole by proceeding in the reverse order, making sure that the gasket of the cover (2) is not damaged and is correctly housed in its seat in the tank.
12. Put back the drain plug (P) and add oil through the filler neck (F) until reaching a level included between the H and L marks on the gauge (G) (see "3.3.2.4 CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP")..
    To top up, use oil suitable for the ambient temperature (see "4.4 FUEL, COOLANT AND LUBRICANTS").
13. Move the boom to a central position and extend the boom, arm and bucket cylinders completely, as shown in the diagram on the right, then remove the filler cap (F).
    Put back the cap and pressurize the tank, lowering the equipment to the ground.



IMPORTANT

- **Make sure that the hydraulic tank is pressurised. If the tank isn't under pressure, the pump will suck in air and this will damage the equipment.**

16. Make sure that all the control levers are in neutral position and let the engine idle for at least 2÷3 minutes before operating the work equipment.
    Move each piston more than once to deaerate the system; check and top up if necessary.
    For details on the bleeding procedure, see "4.9.1.o BLEEDING THE HYDRAULIC SYSTEM".



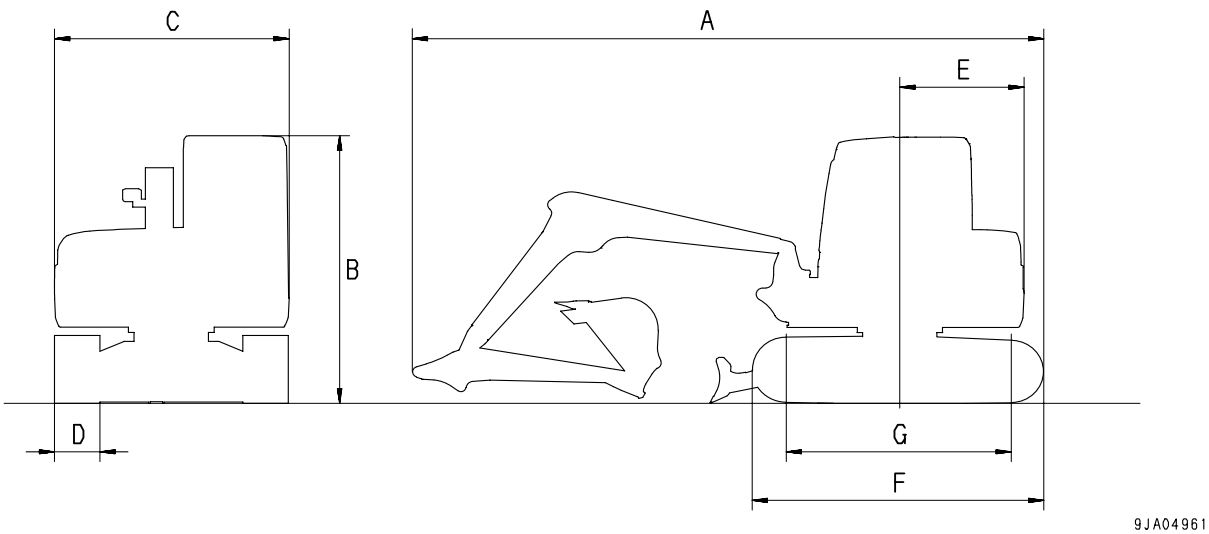
⚠ CAUTION

- **Do not start the engine with empty tank, since this would certainly damage the pump.**

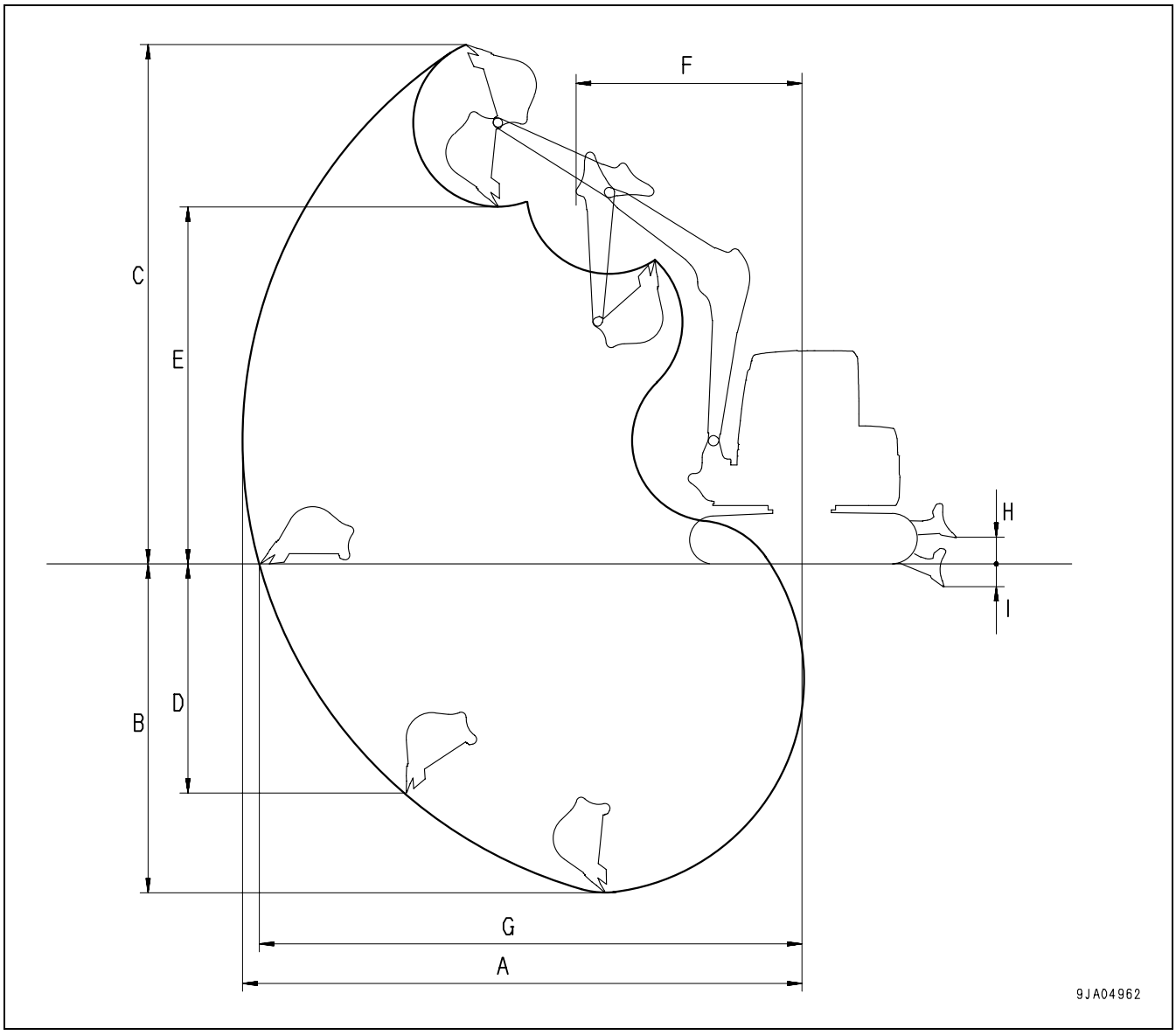
TECHNICAL SPECIFICATIONS

5.1 TECHNICAL DATA

		Unit of measurement	Version with steel tracks	Version with road liners
	Weight of the machine (with blade)	(kg)	8340	8490
	Weight of the machine (with additional counterweight)	(kg)	8560	8710
	Bucket capacity	(m^3)	0,28	
	Engine	—	Engine diesel Komatsu S4D95LE-3	
	Engine power	kW/rpm	51/2000	
A -	Total length	mm	6200	6230
B-	Total height	mm	2700	2730
C	Total width	mm	2330	
D -	Track width	mm	450	
E	Turret swing radius	mm	1315	
F	Total length of the tracks	mm	2840	2900
G -	Tumbler distance	mm	2235	
	Min. ground clearance	mm	360	390
	Travel speed (low/high)	km/h	2,8/4,7	
	Continuous swing speed	rpm	10,0	



	Operating data	Unit of measurement	Version with steel tracks
A -	Max. digging outreach	mm	6960
B-	Max. digging depth	mm	4160
C	Max. digging height	mm	6570
D -	Max. digging depth on vertical wall	mm	2900
E	Max. dumping height	mm	4515
F	Work equipment min. swing radius Min. boom swing radius	mm	2775 1615
G -	Max. outreach at ground level	mm	6750
H -	Max. blade lifting height	mm	500
I	Max. blade working depth	mm	440



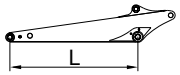
5.2 LIFTING CAPACITIES

⚠ DANGER

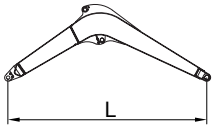
- **Carry out lifting operations only with the machine positioned on firm and flat ground.**
- **Before lifting the load, make sure that the overload alarm device has been connected, see "3.2.2 pos. 12. Overload alarm switch".**

5.2.1 LIFTING CAPACITIES

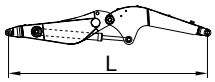
- Arm length L= 1650 mm
- Arm length L= 1900 mm
- Arm length L= 2,250 mm



- Monoboom length L= 3,405 mm

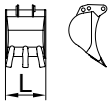


- Two-piece boom length L= 3820 mm

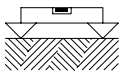


- Max. operating pressure (26.5 MPa / 265 bar)

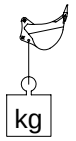
- Standard bucket length and weight L= 650/ kg 175



- Machine parked on firm and level ground



- Lifting capacity



5.2.2 LIFTING CAPACITIES WITH MONOBOOM

NOTE
- The load does not exceed 87% of the hydraulic lifting capacity or 75% of the tipping limit.

LIFTING CAPACITIES WITH ARM L = 1650

L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
1,650 mm	4.5 m	1000	1100			1150	1200		
	3.0 m	750	800	750	800	1150	1200	2300	2350
	1.5 m	650	700	700	750	1050	1100	1950	2000
	0.0 m	700	750	700	750	1000	1050	1850	1900
	-1.5 m	850	950			1000	1050	1900	1950

LIFTING CAPACITIES WITH ARM L=1650 AND 215 kg ADDITIONAL COUNTERWEIGHT

L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
1,650 mm	4.5 m	1100	1200			1300	1350		
	3.0 m	800	850	850	900	1250	1300	2400	2500
	1.5 m	750	800	800	850	1150	1200	2100	2150
	0.0 m	750	800	750	800	1100	1150	2050	2100
	-1.5 m	950	1050			1100	1150	2100	2150

LIFTING CAPACITIES WITH ARM L = 1900

L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
1,900 mm	4.5 m	900	975			1150	1200		
	3.0 m	675	725	725	775	1100	1150		
	1.5 m	600	650	675	725	1025	1075	1925	1975
	0.0 m	625	675	675	725	975	1025	1850	1900
	-1.5 m	750	850			975	1025	1875	1925

LIFTING CAPACITIES WITH ARM L=1900 AND 215 kg ADDITIONAL COUNTERWEIGHT

L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
1,900 mm	4.5 m	1000	1075			1250	1300		
	3.0 m	750	800	825	875	1225	1275		
	1.5 m	725	775	775	825	1125	1175	2075	2125
	0.0 m	700	750	725	775	1075	1125	2025	2075
	-1.5 m	850	950			1075	1125	2050	2100

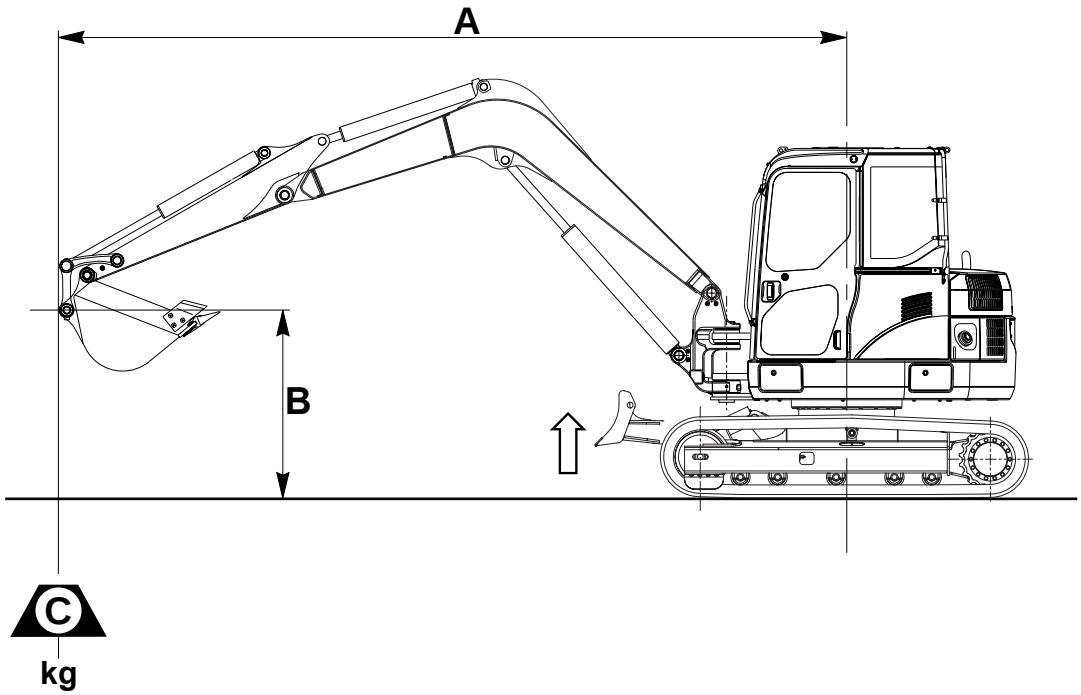
LIFTING CAPACITIES WITH ARM L = 2250

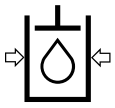
L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
2,250 mm	4.5 m	750	850						
	3.0 m	600	650	700	750	1050	1100		
	1.5 m	550	600	650	700	1000	1050	1900	1950
	0.0 m	550	600	650	700	950	1000	1850	1900
	-1.5 m	650	750			950	1000	1850	1900

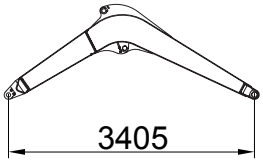
LIFTING CAPACITIES WITH ARM L=2250 AND 215 kg ADDITIONAL COUNTERWEIGHT

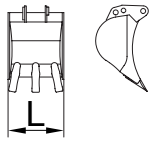
L	A-B	kg							
		max		5.5 m		4.5 m		3.0 m	
2,250 mm	4.5 m	850	950						
	3.0 m	700	750	800	850	1200	1250		
	1.5 m	600	650	750	800	1100	1150	2050	2100
	0.0 m	650	700	700	750	1050	1100	2000	2050
	-1.5 m	750	850			1050	1100	2000	2050

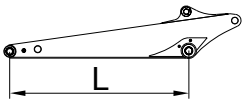
***** Load limited by the hydraulic lifting capacity and not by the tipping limit.

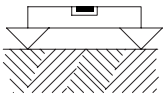












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5.2.3 LIFTING CAPACITIES WITH TWO-PIECE BOOM

NOTE
- The load does not exceed 87% of the hydraulic lifting capacity or 75% of the tipping limit.

LIFTING CAPACITIES WITH ARM L = 1650

L	A-B	kg									
		max		6.0 m		5.0 m		4.0 m		3.0 m	
1,650 mm	4.5 m	900	800			950	815	1450	1365		
	3.0 m	750	650	500	500	950	750	1350	1130	* 2190	* 2190
	1.5 m	500	450	550	500	1000	750	1250	1200	* 1740	1440
	0.0 m	450	400	500	500	900	725	1250	1150	* 3000	2175
	-1.5 m	750	600			850	700	1250	1150	* 2950	2150

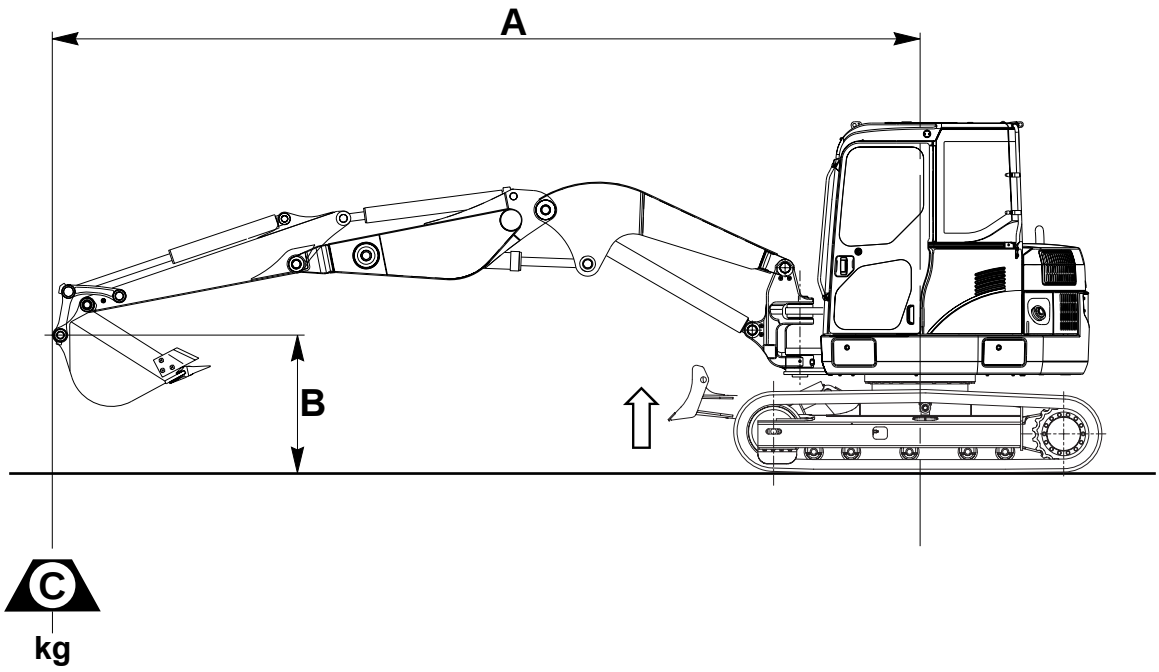
LIFTING CAPACITIES WITH ARM L=1900 AND 215 kg ADDITIONAL COUNTERWEIGHT

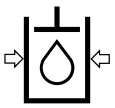
L	A-B	kg									
		max		6.0 m		5.0 m		4.0 m		3.0 m	
1,900 mm	4.5 m	700	650			900	800	* 1500	1300		
	3.0 m	450	400	450	400	850	700	1400	1250		
	1.5 m	375	350	400	350	800	600	1200	1150	* 2400	2000
	0.0 m	450	375	550	400	750	550	* 1850	1400	* 2800	2150
	-1.5 m	550	400	550	400	750	550	* 1800	1400	* 2750	2100

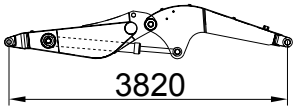
LIFTING CAPACITIES WITH ARM L=2250 AND 465 kg ADDITIONAL COUNTERWEIGHT

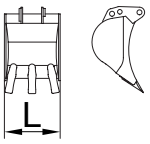
L	A-B	kg									
		max		6.0 m		5.0 m		4.0 m		3.0 m	
2,250 mm	4.5 m	650	600			950	900				
	3.0 m	400	350	500	450	900	850	1500	1400		
	1.5 m	350	300	450	400	850	800	1450	1350		
	0.0 m	400	350	600	450	800	750	1400	1300	* 2300	1900
	-1.5 m	600	450	600	450	800	750	1400	1300	* 2200	1900

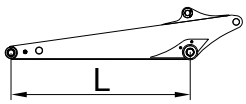
* Load limited by the hydraulic lifting capacity and not by the tipping limit.

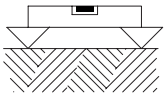












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AUTHORISED OPTIONAL EQUIPMENT

6.1 AUTHORIZED OPTIONAL EQUIPMENT

⚠ CAUTION

- **When installing and using optional equipment, carefully read the relevant manual and keep to the instructions given therein.**
- **Use only optional or special equipment recommended and approved by Komatsu and in compliance with the requirements indicated (see "6.1.3 CHARACTERISTICS OF THE OPTIONAL EQUIPMENT").**
- **Komatsu cannot be held liable for any injury, damage or product failure resulting from the installation and use of unauthorized equipment.**

6.1.1 PRECAUTIONS REGARDING SAFETY

If attachments or optional equipment other than those authorized by Komatsu are installed, this will not only affect the life of the machine, but will also cause safety problems.
Before installing attachments not listed in this manual, contact your Komatsu Dealer.
Komatsu declines any responsibility for accidents or failures due to the use of unauthorized equipment.

⚠ WARNING

- **When removing or installing any equipment, take the following precautions and be careful to ensure that operations are carried out in total safety.**
- **Carry out installation and removal on a firm and flat surface.**
- **When the operations are carried out by two or more operators, decide the communication signals in advance and respect them during work.**
- **Use a crane to handle objects weighing more than 25 kg.**
- **Always support any heavy part of the machine before removing it. When lifting heavy parts, be always careful to the position of their centre of gravity.**
- **It is dangerous to carry out any operation with suspended loads. Always position the load on a suitable support and make sure that it is stable.**
- **When installing or removing any equipment, make sure that it is stable and cannot fall down.**
- **Never stand under loads being lifted by a crane.**
  Take care to choose a safe position, in such a way as to avoid any risk in case the load should fall down.

IMPORTANT
- **Cranes must be operated by specialized personnel. Do not allow untrained personnel to use cranes.**

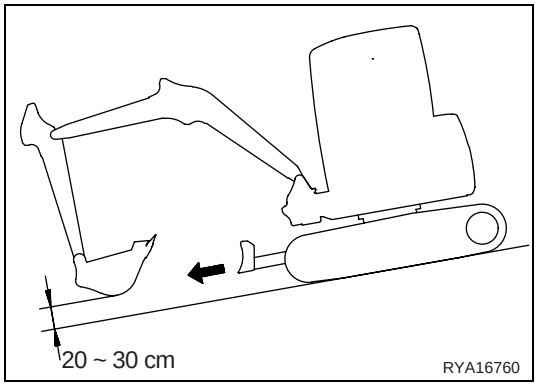
For further details regarding installation and removal operations, contact your Komatsu Dealer.

6.1.2 PRECAUTIONS REGARDING THE INSTALLATION OF EQUIPMENT

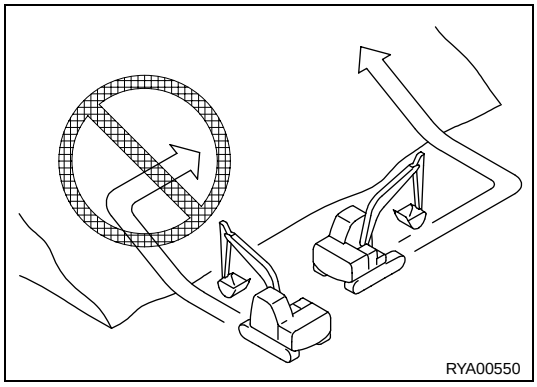
⚠ WARNING

- **The installation of long or heavy work equipment may affect the stability of the machine. Therefore, be particularly careful when moving down a steep slope or when swinging the equipment on a slope, since the machine may lose its balance and overturn.**
- **Avoid carrying out the following operations, since they are particularly dangerous.**

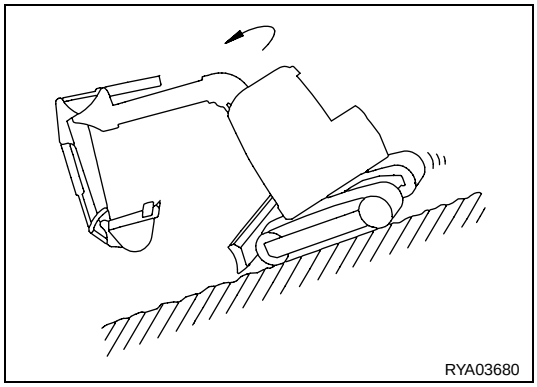
1. **Travelling downhill with lifted equipment.**



2. **Crossing slopes transversally.**



3. **Swinging the turret on slopes.**



- **When work equipment with overall dimensions exceeding those of the standard equipment is installed, be particularly careful, since more space is necessary for manoeuvring the equipment and for swinging the turret.**
- **Always follow the correct procedure when installing the boom and the arm.**
  Any incorrect procedure may lead to serious risks; contact your Komatsu Dealer before installation.

6.1.3 CHARACTERISTICS OF THE OPTIONAL EQUIPMENT

(Specific weight of the handled material = 1.8 t/cu m)

EQUIPMENT	MAX. WEIGHT (kg)	MAX. DIMENSIONS		MAX. CAPACITY SAE (m^3)	MAX. OPERATING PRESSURE (bar)	MAX. FLOW RATE (l/min.)
		Width (mm)	Height (mm)			
Backhoe bucket	200	750	—	0,28	—	—
Ditch-cleaning bucket	180	1500	—	0,28	—	—
Ditch-digging bucket	180	1600	900	0,38	—	—
Adjustable bucket	250	1500	1000	0,25	★ 280	■ 130
Clamshell bucket	□ 300	400	1000	0,20	★ 280	■ 130
Hydraulic breaker	400	—	1400	—	★ 280	■ 130

□ Hydraulic rotor included

★ System pressure

■ System capacity

6.2 ARRANGEMENT FOR THE INSTALLATION OF THE DEMOLITION HAMMER

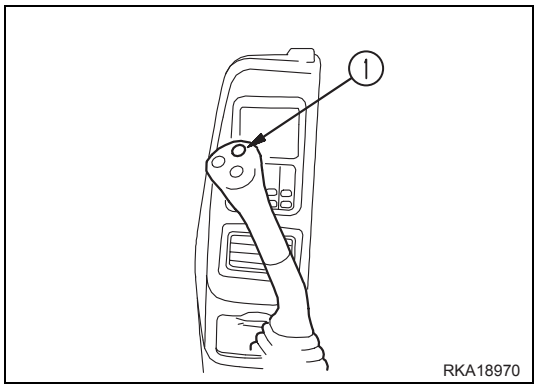
⚠ WARNING

- **For the characteristics of the hammer, see "6.1.3 CHARACTERISTICS OF THE OPTIONAL EQUIPMENT".**
- **The demolition hammer is very noisy, therefore always wear headphones when using it.**

6.2.1 DESCRIPTION AND CONTROL

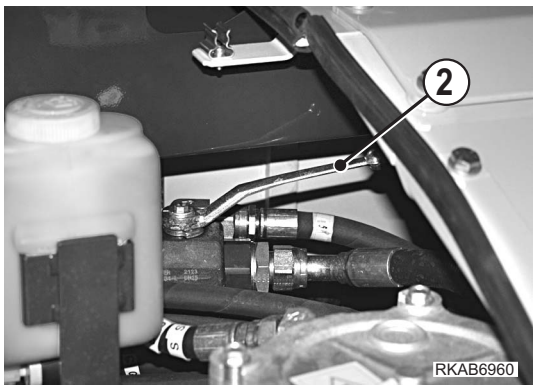
The machine is equipped for the installation of a demolition hammer on the arm instead of the standard bucket.
It is controlled by means of a button (1) positioned on the right joystick.

The hammer is operated by pressing the button (1), since in this way pressurized oil is conveyed into the delivery circuit (left side); release the button to stop the hammer.



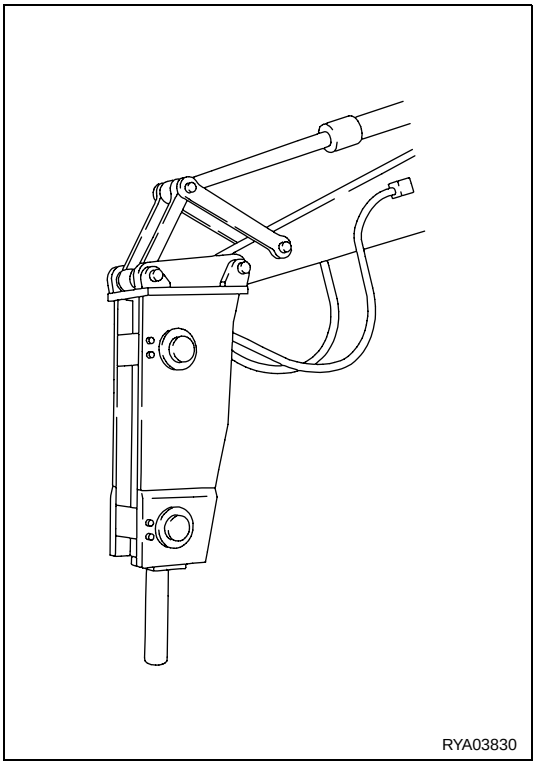
⚠ CAUTION

- **Before using the demolition hammer, make sure that the lever of the selection valve (2) is completely turned anticlockwise.**



6.2.2 USE OF THE DEMOLITION HAMMER AND RULES TO BE OBSERVED

The choice of the suitable hammer is a very important factor when maximum productivity is required. The shape and size of the tool must be defined according to the nature of the material to be broken and to the type of work to be carried out.
The hammer is used to break floors, cement structures, walls, small rocky surfaces, excavations with open section, aspahlt, etc.
With the application of special accessories it can also be used as asphalt-cutter or compactor.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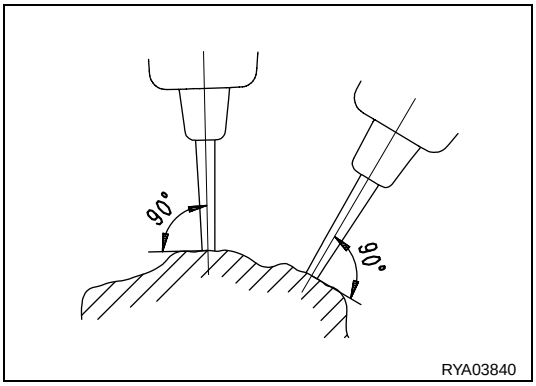
HOW TO USE THE BREAKER CORRECTLY

1. Make sure that the position of the breaker with respect to the material to be broken is as perpendicular as possible and that the arm thrust is sufficient, so that all the power of the breaker can be exploited.



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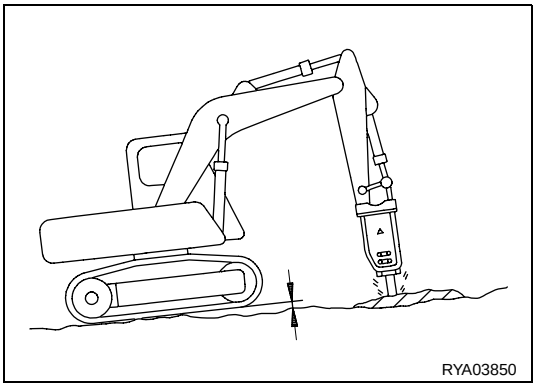
2. It is absolutely necessary to keep the pressure of the excavator on the breaker constant as the bit penetrates the ground. Always accompany the breaker as it penetrates and use the excavator arms to obtain such a pressure as to keep the undercarriage lifted approx. 5 mm from the ground.
Avoid lifting the undercarriage more than necessary.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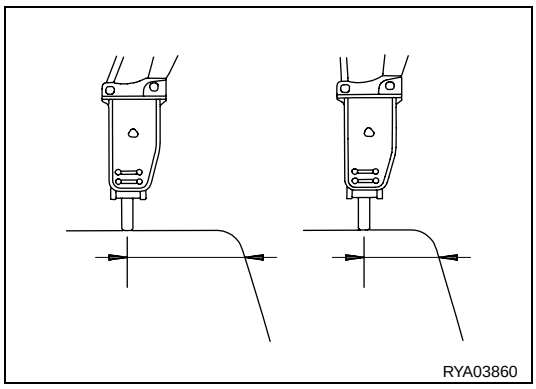
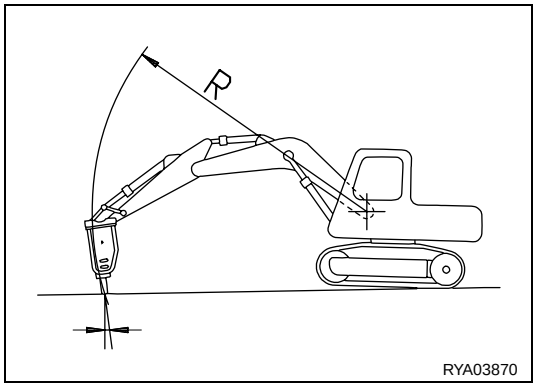
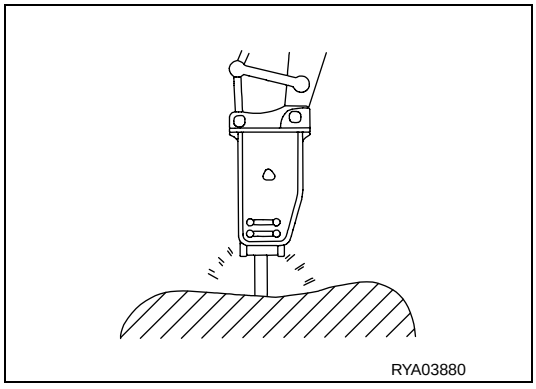
3. When working on very hard materials it is important to avoid hitting the same point for more than 30 seconds.
   Hit the same point for a few seconds and change position continuously: in this way the material breaks more easily.



4. To facilitate the sliding of the tool on its seat, check the thrust direction and always correct the hitting position of the breaker using the bucket and arm control.



5. Always make sure that the thrust is optimal, in order to avoid dangerous and useless strokes.



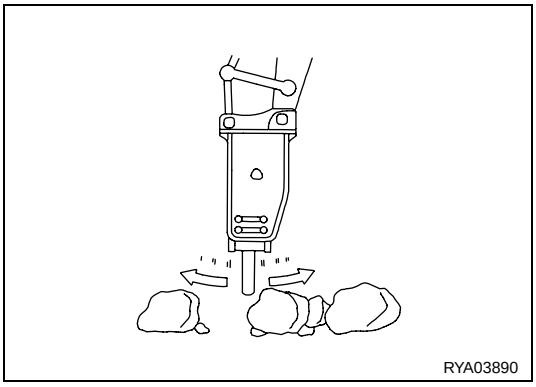
UNAUTHORIZED USES

Avoid the operations described below in order to extend the life of the machine and to work in total safety.

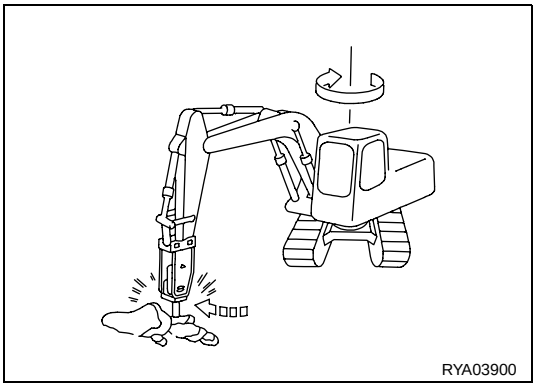
IMPORTANT

- **During work, do not use the demolition hammer with the bucket cylinder at the end of stroke, but always leave a free space of approximately 5 cm.**

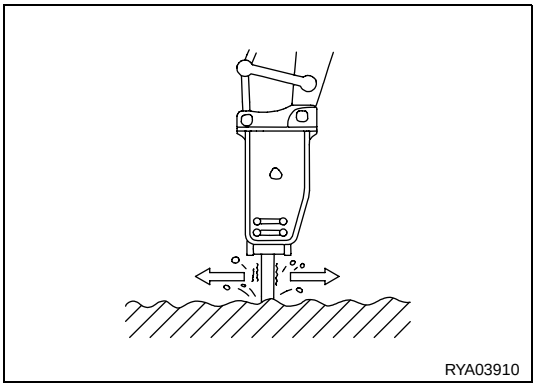
1. Gathering or moving stones with the hydraulic breaker.


RYA03890

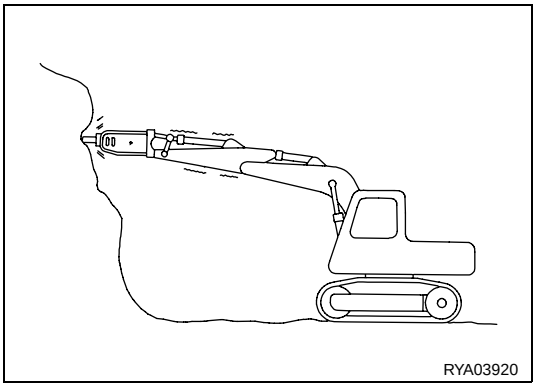
2. Swinging the turret while using the breaker.


RYA03900

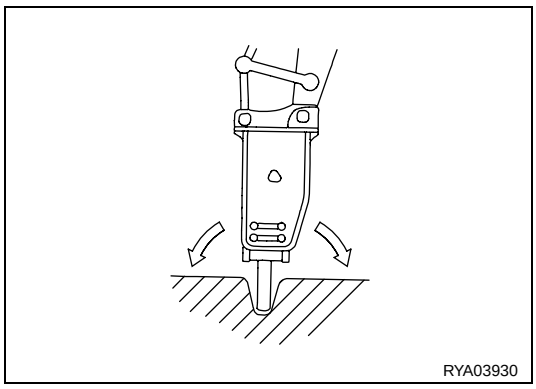
3. Moving the tool while it is hitting the material to be broken.


RYA03910

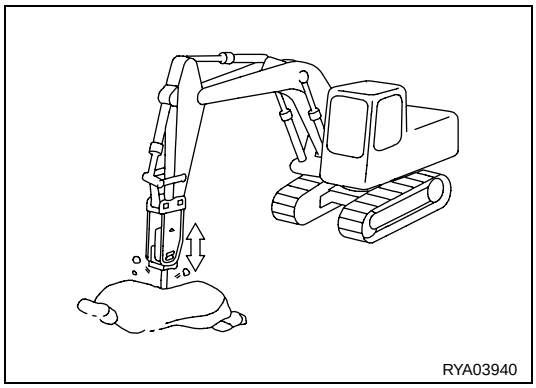
4. Working with the breaker in horizontal position or even more inclined.


RYA03920

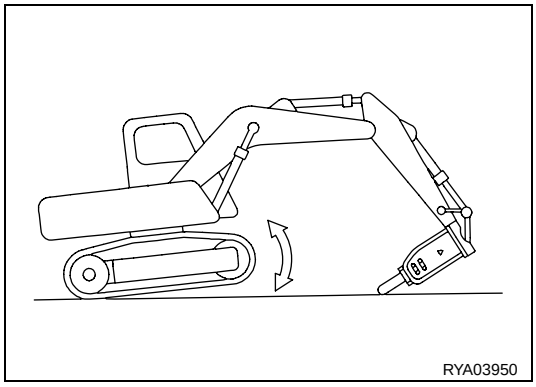
5. Levering with the tool after driving it into the material to be broken.



6. Hitting the ground with the breaker bit.

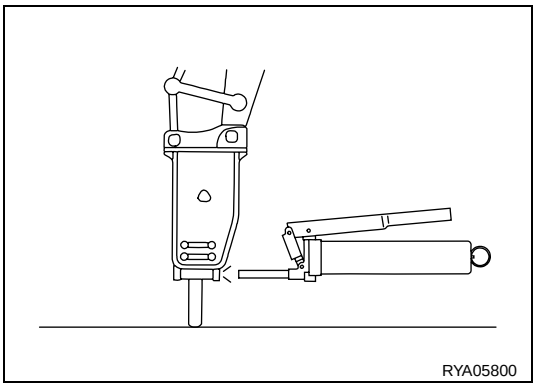


7. Lifting the machine by levering on the breaker bit with the bucket cylinder completely extended.



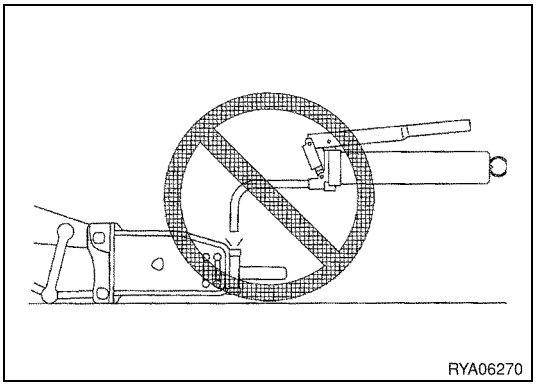
LUBRICATION

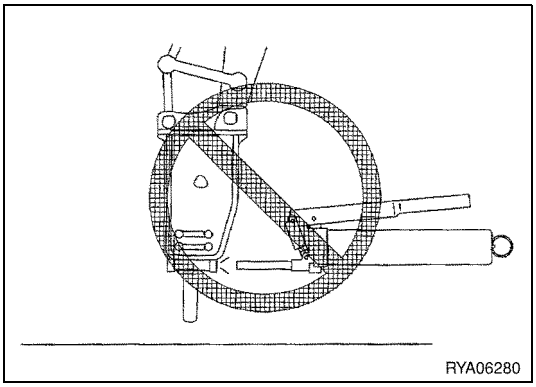
Take care to lubricate the hammer keeping it in the correct position.



IMPORTANT

- **If grease is injected with the hammer in the wrong position, the hammer will receive more grease than necessary. Consequently, soil and sand may penetrate in the hydraulic circuit and damage the hydraulic equipment while the hammer is being used. Take care to lubricate the hammer keeping it in the correct position.**





6.2.3 INSTALLING AND REMOVING THE DEMOLITION HAMMER

6.2.3.1 INSTALLATION

⚠ WARNING

- **Park the machine on a firm and level surface and lower the equipment to the ground.**
- **For the installation, the hammer must be positioned horizontally, with the bit directed towards the machine.**
- **When the coupling pins are removed or installed, chips may come off; always use gloves, goggles and helmet.**
- **The change of the equipment must be carried out by two operators, who must decide together the words and signals to be used during work.**
- **Avoid using your fingers to align the holes, since the may be injured or even cut off.**
- **Before carrying out any operation on the hydraulic circuit, eliminate the residual pressure from the equipment circuits by shifting the controls more than once and from the tank by slowly loosening the filler cap.**
- **Immediately clean any area dirty with oil.**

For the installation of the demolition hammer it is necessary to connect the mechanical constraints by proceeding as described in paragraph "3.3.20 CHANGING THE BUCKET" and to carry out the hydraulic connections using the pipes provided.
After connecting the mechanical constraints, carry out the hydraulic connections by proceeding as follows:

1 - Stop the engine and shift the equipment controls in all directions, in order to release the residual pressure from the circuits.

2 - Turn the ignition key to position «**I**» and press the hammer control button (4) to release the residual pressure from the hammer delivery pipe.

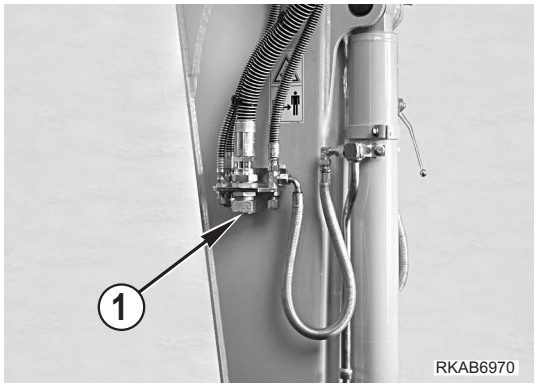
3 - Turn the ignition key to position «**O**» and remove it.

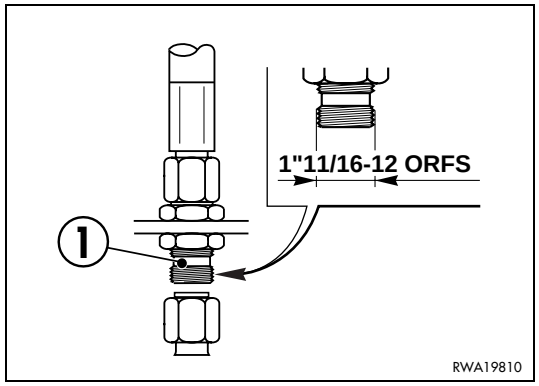
4 - Remove the plugs of the machine pipes and of the hammer hoses.
Use 41 and 50 mm wrenches.

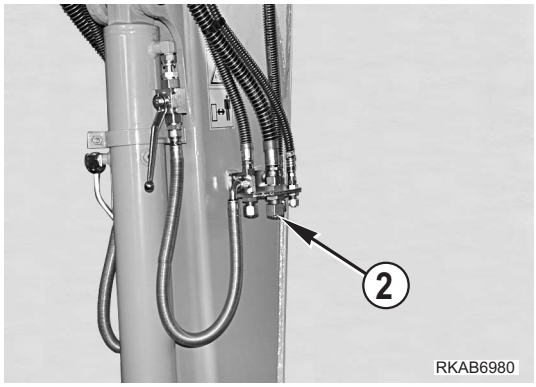
5 - Connect the right pipe to the coupling (1) and the left pipe to the coupling (2), making sure that the characteristics and the size of the pipe fittings are as required.

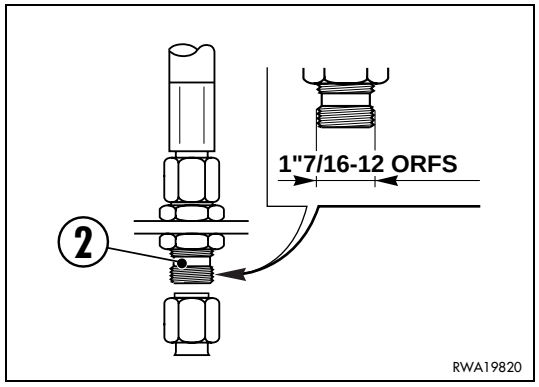
⚠ CAUTION

- **When connecting the pipes, take care to prevent any impurities from getting into them.**







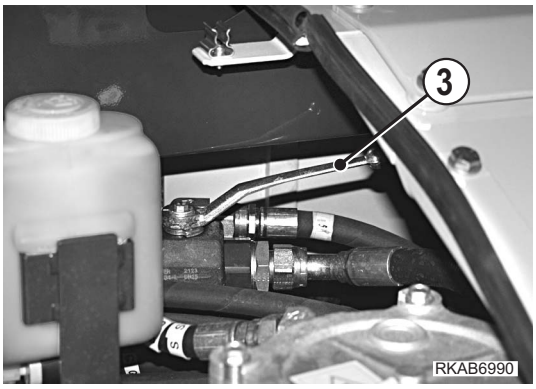


6 - Turn the selection valve lever (3) anticlockwise, until reaching the stop position.

7 - Start the machine and raise the demolition hammer positioning it vertically.

8 - Stop the machine again and lubricate the arm connection joints (see "4.9.7.a LUBRICATION") and the hammer (see the specific operation and maintenance manual).

9 - Before starting work, check the tightness of the circuit.



⚠ WARNING

- **Wear thick gloves and safety goggles during this check.**
- **To check the system for leakages, use a piece of cardboard or a wooden board.**

6.2.3.2 REMOVING THE HAMMER

To remove the hammer, proceed as follows:

1 - Position the hammer on the ground, taking care to choose a level surface and make sure that it is safe and stable even after disconnection from the machine.

2 - Stop the engine and shift the equipment controls in all directions, in order to release the residual pressure from the hydraulic circuits.

3 - Turn the ignition key to position «**I**» and press the hammer control button (4) to release the residual pressure from the hammer delivery pipe.

4 - Turn the ignition key to position «**O**» and remove it.

5 - Disconnect the hammer delivery and return pipes.
Use 41 and 50 mm wrenches.

6 - Fit the pipe plugs.

⚠ WARNING

- **Make sure that the plugs are properly tightened and that there are no leakages; if the circuit is inadvertently pressurized, small leakages can be turned into thin jets that may perforate the skin or injure the eyes.**
- **Always wear thick gloves and safety goggles to carry out this check.**
- **To check the system for leakages, use a piece of cardboard or a small wooden board.**

7 - Disconnect the hammer from the mechanical retainers, proceeding as described in paragraph "3.3.20 CHANGING THE BUCKET".

6.2.4 MAINTENANCE

The hydraulic system does not require any operation and inspection other than those prescribed for the routine maintenance of the machine.
Regarding the maintenance operations required for the hammer, see the specific operation manual.

6.3 ARRANGEMENT FOR THE INSTALLATION OF THE CLAMSHELL BUCKET SWING SYSTEM (second hydraulic line)

DESCRIPTION AND CONTROL

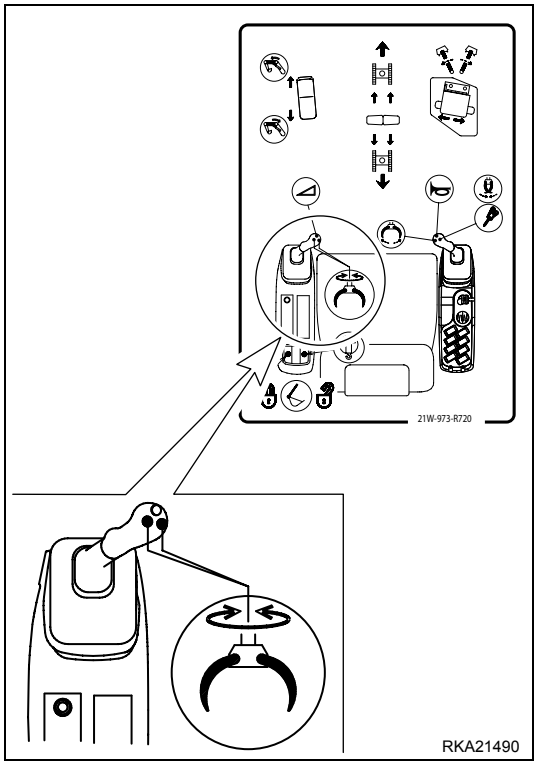
⚠ WARNING

- **When installing the clamshell bucket on the excavator arm, consider the greater overall dimensions due to the swinging of the equipment.**
- **Read the contents of the equipment instruction manual carefully before using the machine or carrying out maintenance operations.**

The machine is equipped for the installation of a clamshell bucket with hydraulic swing on the arm instead of the standard bucket.
An independent hydraulic circuit (second hydraulic line) is available for the bucket swing.

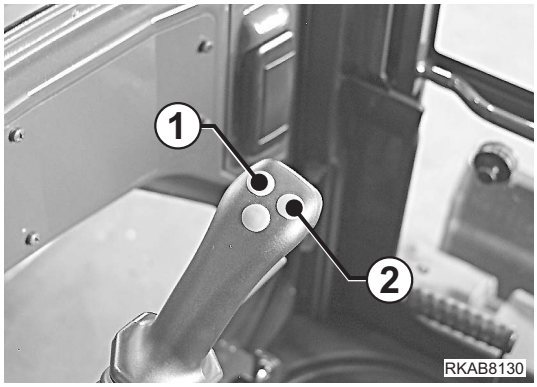
The clamshell bucket swinging movements are managed through the push buttons (1) and (2) on the left control lever. The swing movements are the following:

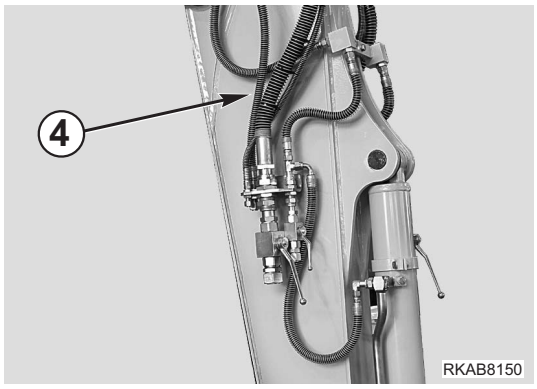
1. Push button (1) pressed: oil flow delivered to the hydraulic line (3) positioned in the left side of the arm.
2. Push button (2) pressed: oil flow delivered to the hydraulic line (4) positioned in the right side of the arm.

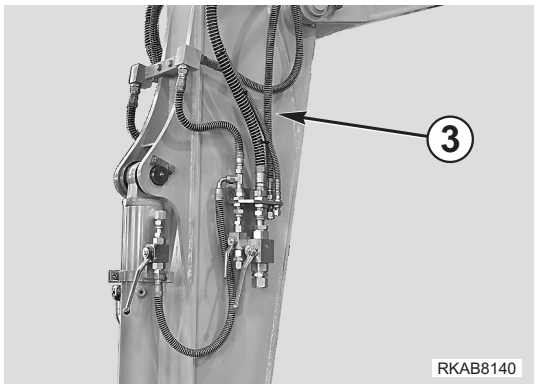


IMPORTANT

- **For the use of the controls, refer to the diagram on the right window and to the instructions contained in the use and maintenance manual.**







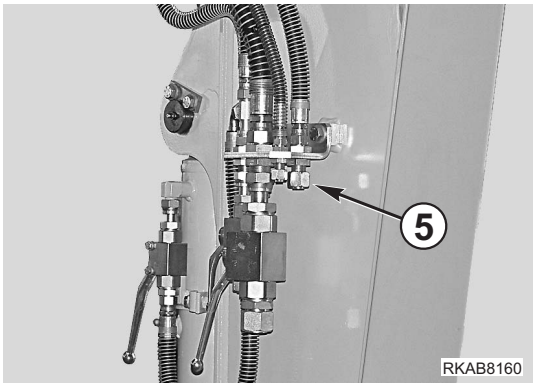
CONNECTING THE HYDRAULIC CIRCUIT

⚠ WARNING

- **Avoid connecting any equipment to the hydraulic lines before said equipment has been correctly installed from a mechanical point of view and fixed to the arm.**
- **Before carrying out any operation on the hydraulic circuit, stop the engine and eliminate any residual pressure from the equipment circuit, by shifting the controls more than once, and from the oil tank, by slowly loosening the filling cap.**
  Immediately clean any area dirty with oil.
- **All the equipment disassembly and assembly operations must be carried out with the machine parked on firm and level ground.**
- **When removing the hydraulic connections, be extremely careful, in order to prevent any impurities from getting into the pipes.**

After mechanically installing the equipment, position the machine on firm and level ground, stop the engine, release the residual pressures from the system and proceed as indicated below:

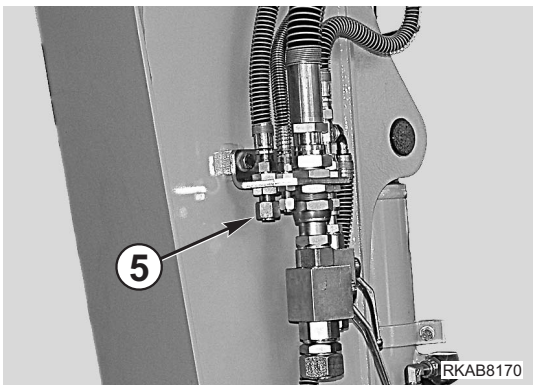
1. Remove the plugs (5).
   Be careful not to loose or damage any of the parts removed.
2. Connect the pipes for the clamshell bucket swing, making sure that the characteristics and dimensions of the fittings (6) correspond to those indicated in the diagram.



NOTE

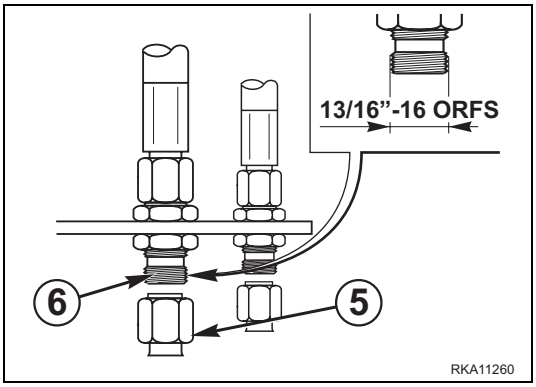
- For the characteristics of the threads and the functions of the equipment couplings, refer to the user manual provided by the manufacturer.

3. After connecting the pipes, start the engine (see "3.3.6 STARTING THE ENGINE") and let it idle for at least 10 minutes.
4. Lift the equipment from the ground and rotate it clockwise and anticlockwise for a dozen times, in such a way as to bleed the circuit.
5. After the bleeding operation, stop the engine and wait at least 5 minutes before starting work. This will eliminate the air bubbles accumulated inside the tank.
6. Make sure that there are no oil leakages and remove any oil that may have been spilled.



IMPORTANT

- **In case of doubts regarding the connection of the hydraulic circuit to the equipment, contact your Komatsu Dealer.**



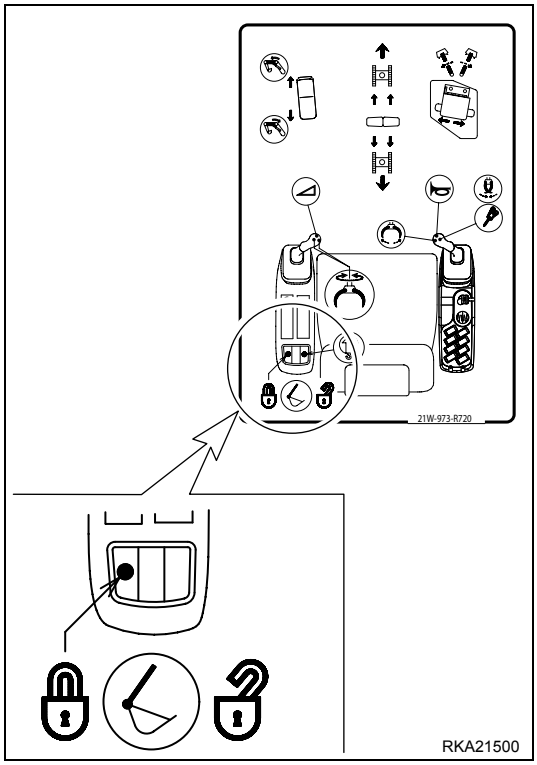
6.4 ARRANGEMENT FOR THE INSTALLATION OF THE BUCKET QUICK COUPLING SYSTEM (Third hydraulic line)

DESCRIPTION AND CONTROL

⚠ WARNING

- **Read the contents of the equipment instruction manual carefully before using the machine or carrying out maintenance operations.**

An hydraulically-controlled quick coupler can be installed on the machine to enable the bucket or other equipment to be changed more easily and quickly.
An independent hydraulic circuit (third hydraulic line) controlled through a switch (1) positioned on left cabinet is used to connect and disconnect the bucket or other equipment.
This is a two-position switch with automatic return to the centre, equipped with a mechanical retainer (2) to prevent accidental impacts.

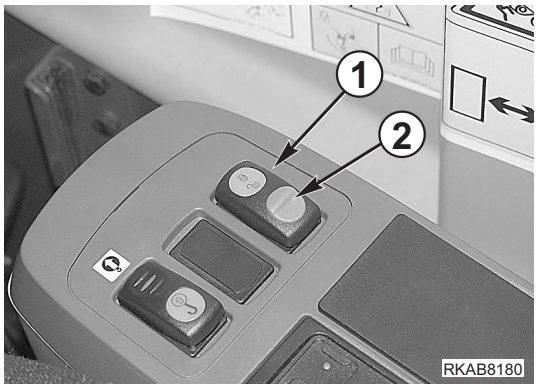


COUPLING POSITION (A)

To couple the bucket or other equipment, press the lower part of the switch (A).

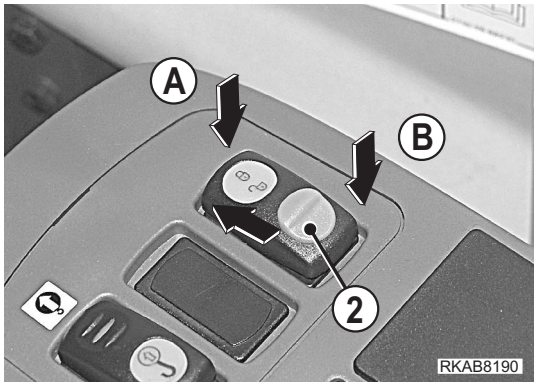
RELEASE POSITION (B)

To release the bucket, slide the safety lever (2) backward and at the same time press the upper part of the switch (B).



NOTE

- The warning light on the switch is always on and indicates that the quick coupler is at rest. It goes out temporarily only when the switch is pressed, to indicate that the bucket or other equipment is being coupled or released.



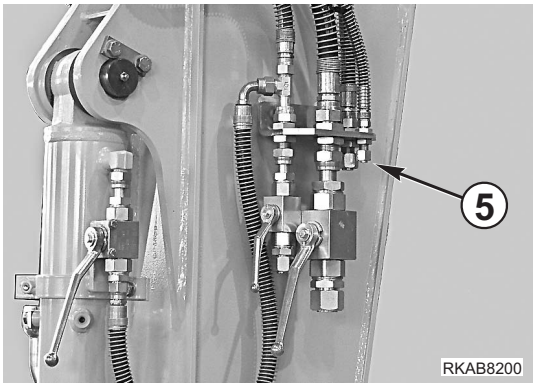
CONNECTING THE HYDRAULIC CIRCUIT

⚠ WARNING

- **Avoid connecting any equipment to the hydraulic lines before said equipment has been correctly installed from a mechanical point of view and fixed to the arm.**
- **Before carrying out any operation on the hydraulic circuit, stop the engine and eliminate any residual pressure from the equipment circuit, by shifting the controls more than once, and from the oil tank, by slowly loosening the filling cap.**
  Immediately clean any area dirty with oil.
- **All the equipment disassembly and assembly operations must be carried out with the machine parked on firm and level ground.**
- **When removing the hydraulic connections, be extremely careful, in order to prevent any impurities from getting into the pipes.**

After mechanically installing the equipment, position the machine on firm and level ground, stop the engine, release the residual pressures from the system and proceed as indicated below:

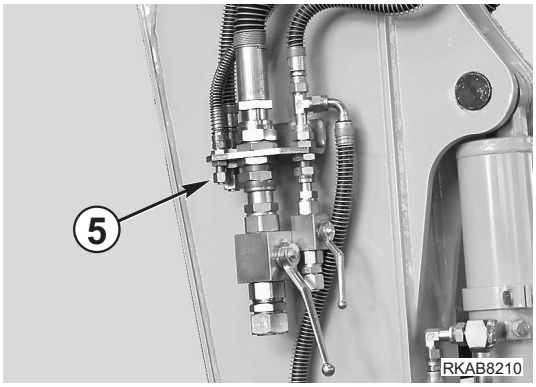
1. Remove the plugs (5).
   Be careful not to loose or damage any of the parts removed.
2. Connect the pipes to the quick coupler, making sure that the characteristics and dimensions of the fittings (6) correspond to those indicated in the diagram.



NOTE

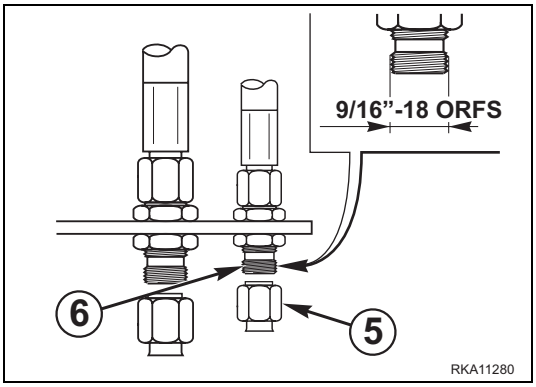
- For the characteristics of the threads and the functions of the equipment couplings, refer to the user manual provided by the manufacturer.

3. After connecting the pipes, start the engine (see "3.3.6 STARTING THE ENGINE") and let it idle for at least 10 minutes.
4. Lift the equipment from the ground and convey pressurized oil to the coupler a dozen times, in such a way as to bleed the circuit.
5. After the bleeding operation, stop the engine and wait at least 5 minutes before starting work. This will eliminate the air bubbles accumulated inside the tank.
6. Make sure that there are no oil leakages and remove any oil that may have been spilled.



IMPORTANT

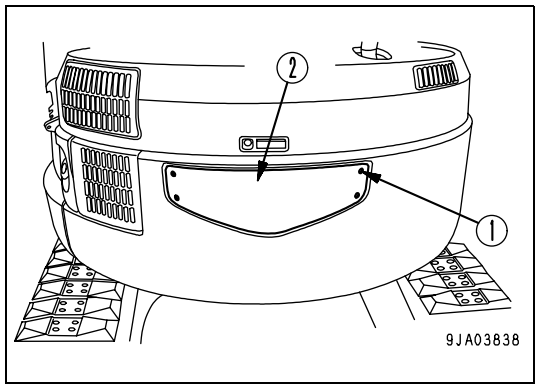
- **In case of doubts regarding the connection of the hydraulic circuit to the equipment, contact your Komatsu Dealer.**



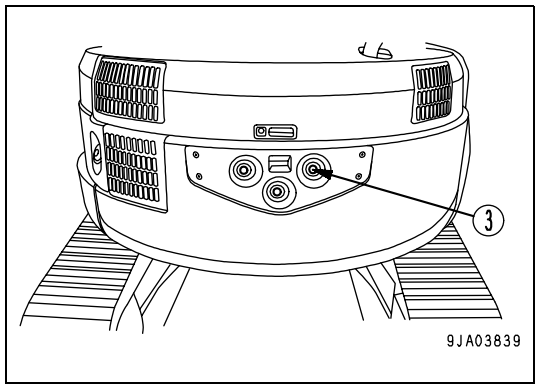
6.5 INSTALLING AND REMOVING THE ADDITIONAL COUNTERWEIGHT

⚠ WARNING

- **To lift the additional counterweight, use properly dimensioned cables and avoid using worn cables or cables with broken strands.**
- **Do not lift the additional counterweight in any other way than described here below, since it may lose balance.**
- **When lifting the additional counterweight, make sure that it is correctly balanced, proceed slowly and do not allow anyone to get near the load.**
- **Before lifting the additional counterweight, make also sure that the eyebolts are correctly fastened to the upper holes.**



1. Loosen the 4 screws (1) and remove the rear plate (2).
2. Remove the plugs (3).

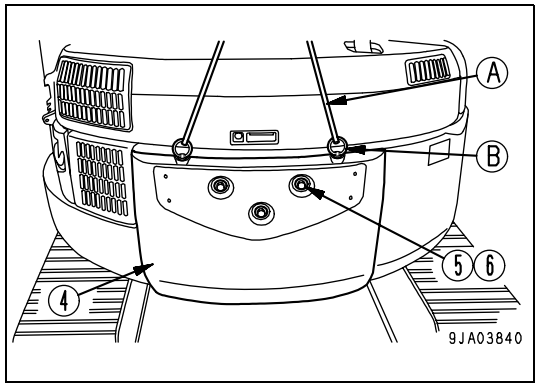


3. Lift the additional counterweight (4) with a crane and install it on the back of the standard counterweight.

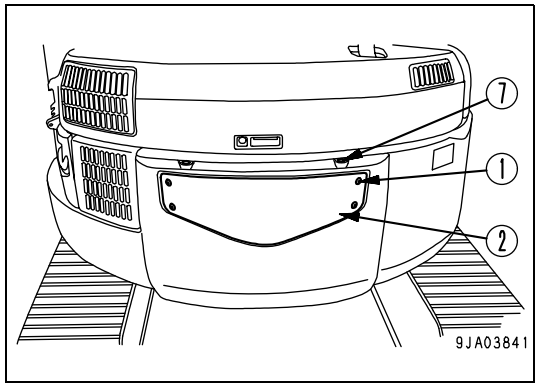
IMPORTANT

- **Use a cable (A) and eyebolts (B) properly dimensioned for the weight to be lifted.**
  Weight of the additional counterweight: 220 kg

4. Install the washers (6) and the nuts (5) and fix the additional counterweight by tightening the nuts (5) with the appropriate torque.
   Driving torque: from 455 to 565 Nm (from 46.5 to 58 kgfm).



5. Install the plugs (7) on the holes provided for fastening the eyebolts.
6. Put back the rear plate (2).



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